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ELECTRICAL WORLD

MAY 17, 1930

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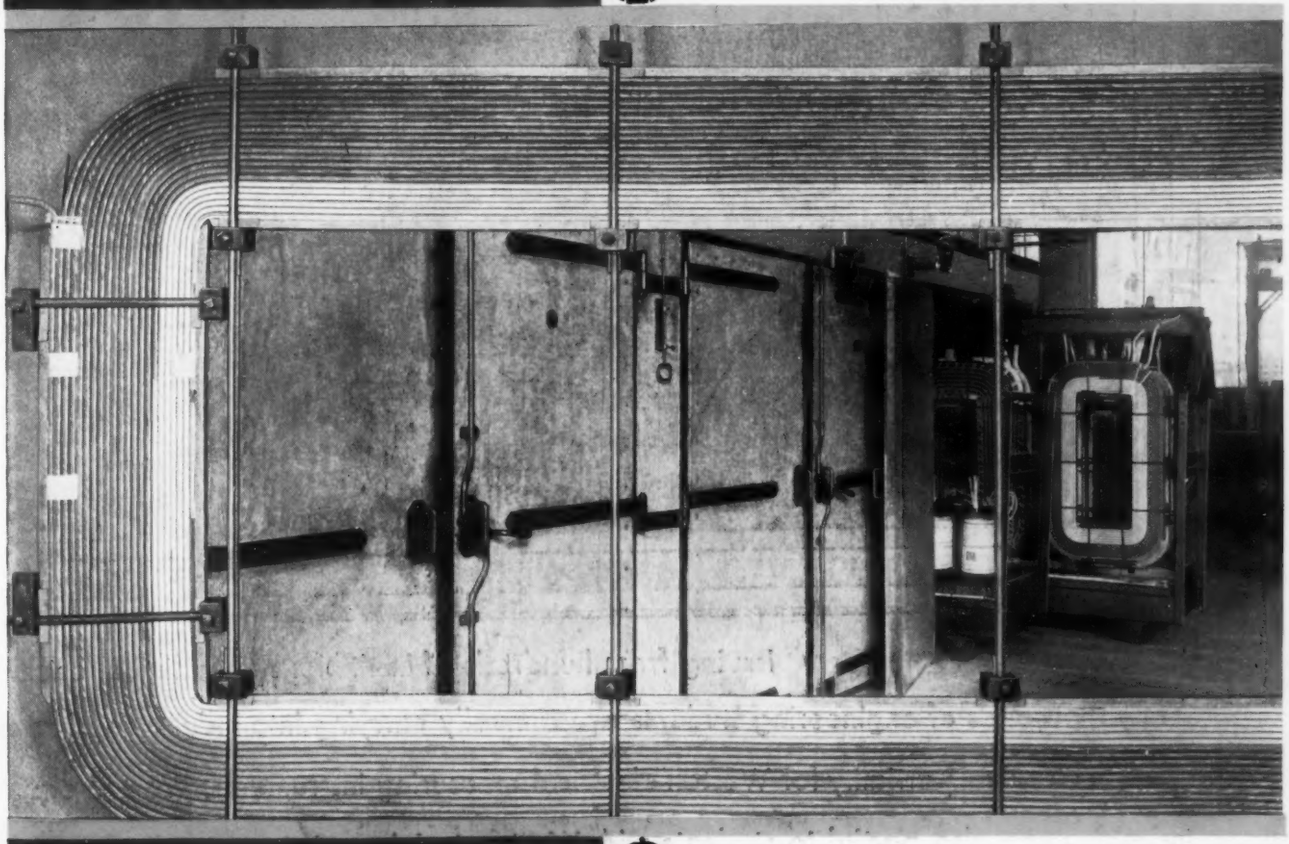

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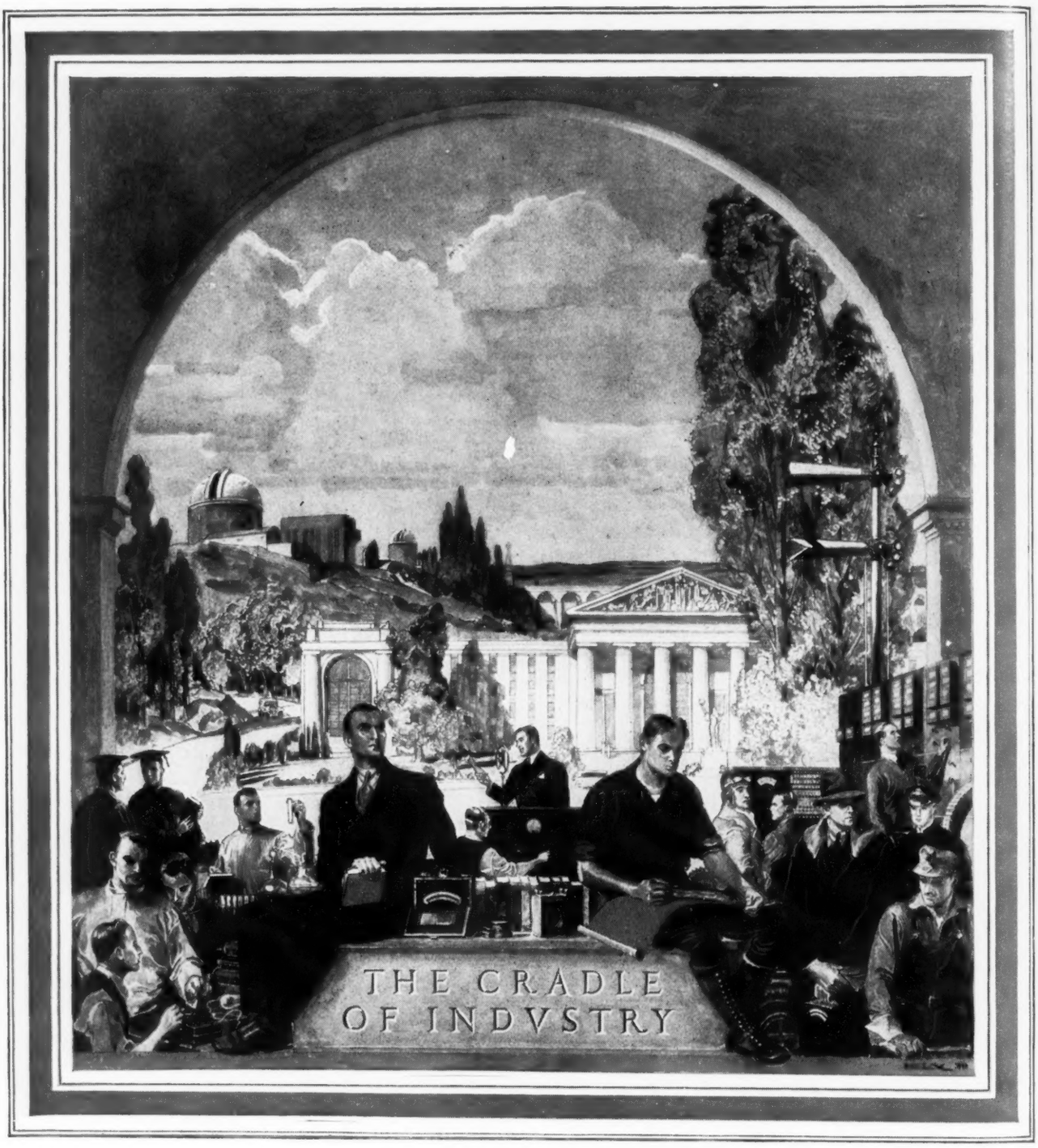

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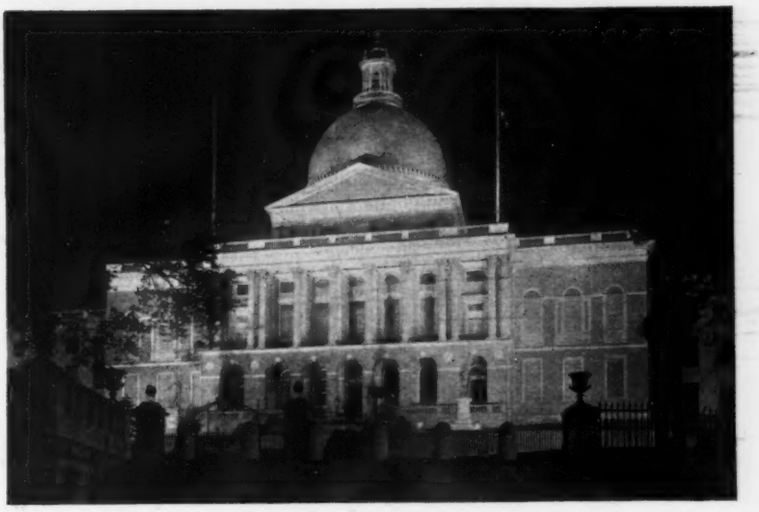

MAY 17, 1930

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VOLUME 95 . . . NUMBER 20

News of the Industry 961

Securing Reliability and Economy in Metropolitan Service 974
By ALEX B. BAILEY, *Commonwealth Edison Company*

Maximum Volume in Sales 982

Sawmill Uses 22,794 Hp. 986
By A. H. ONSTAD, *Weyerhaeuser Timber Company*

Too Many Specifications—Too Inadequate Drawings 993
By M. M. SAMUELS, *J. G. White Engineering Corporation*

Rebuilt Hydro Plant Saves Money and Water .. 995

Editorials 971

Welded Switchrack Built at Less than Cost of Fittings 979

Steel Poles for Special Use 980

Dispatcher's Board Uses Electrically Operated Targets 981

Truck Tower Aids Assembly of Street-Lighting Structures 983

Making Low-Voltage Industrial Circuits Safer 984

Long Beach Continues Its High Economy 984

Uhl River Project to Develop 185,000 Hp. for India 991

Dense Forest No Barrier to Transmission Line 992

Electric and Fuel Costs for Four Heat-Treating Installation 996

Financial and Statistical 1001

New Equipment Available ... 1008

Electrical Industry Facts 1009

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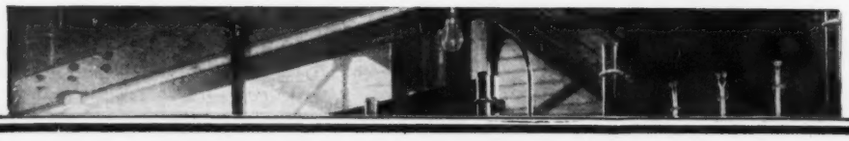
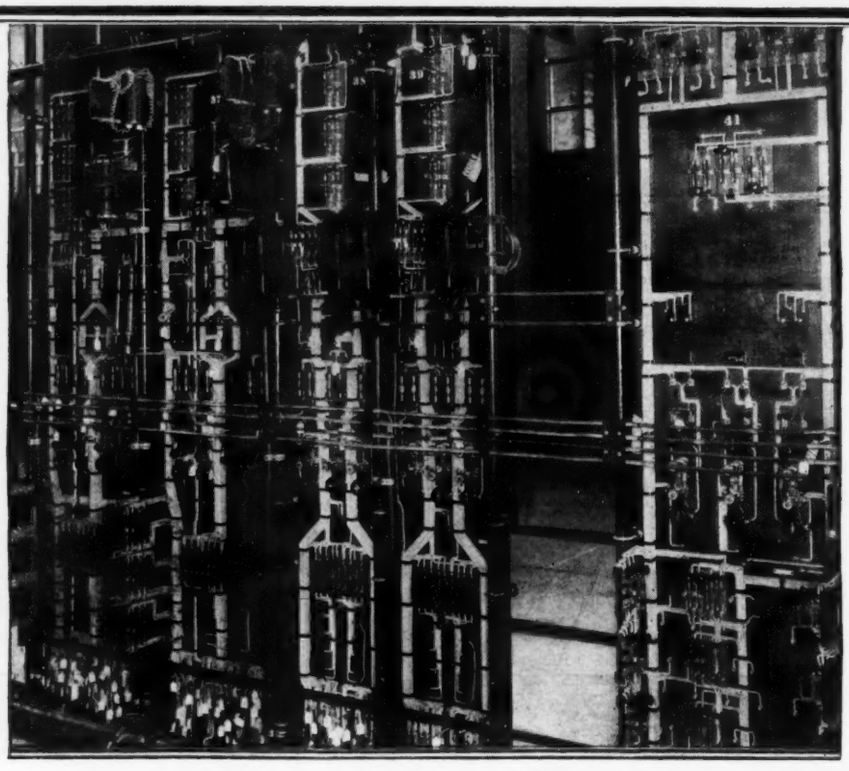


THE JOB THAT MUST BE PERFECT



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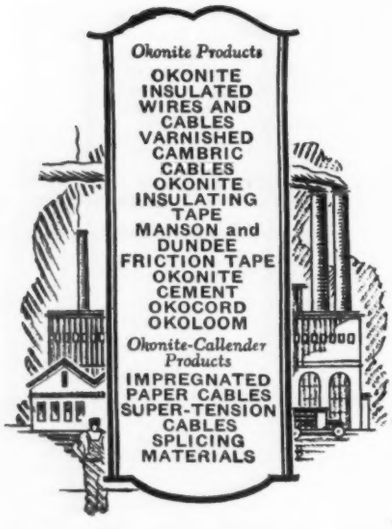

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ELECTRICAL WORLD

for the Week Ending

May 17, 1930

North American Company Probe Next

Copper Sales 190,000 Tons for Week

Better Transmission Lines Promised

Senate Passes a Couzens Power Bill

—UNIFICATION appears likely of six Eastern utility companies, together producing one-fourth of country's electrical output. A $5,000,000,000 proposition.

—BOULDER DAM action faces bitter fight. Arizona will lead the fray, citing Supreme Court decision in Chicago diversion case to prove illegality of Los Angeles-federal contracts.

—NORTH AMERICAN Company to be next in Federal Trade Commission spotlight. Hearings of third Bond & Share property, National Power & Light, indefinitely postponed.

—MUSCLE SHOALS bill lacking in several virtues awaits barrage of words in House. Debate starts Tuesday.

—SALES VOLUME best obtainable by advertising, is conclusion of an economic analysis. Distribution of merchandise and services remains the big problem of industries.

—REGULATION reform urged in Oregon by senior commissioner, who favors Wisconsin pattern. The contagion spreads, while cure is as unknown as ever.

—COPPER at 13 cents stimulates 190,000-ton domestic and foreign sales for week. A record. Output declines. Prices stronger, is outlook.

—MANUFACTURERS of electrical equipment abroad, including American interests, bury the hatchet and substitute co-operation? End of patent fights foreseen.

NEWS OF THE WEEK

Better Transmission Lines Promised at Northeastern A.I.E.E. Meeting

REDUCED interruptions to service and minimized costs for tower erection were two of the promises offered by transmission engineers at the Northeastern district meeting of the American Institute of Electrical Engineers, held in Springfield, Mass., last week.

Wood construction and post type towers favored

Researches on 66-kv. lines by F. E. Andrews, Public Service Company of Northern Illinois, and C. L. Stroup, Jeffery DeWitt Insulator Company, have led to a new design of pole structures in which wooden crossarms are substituted for metal and conductor spacing increased by relocation of insulators. It is concluded that: (1) Performance under lightning conditions of wooden pole lines of moderate voltage can be greatly improved by making use of the value of wood; (2) overhead ground wiring as usually installed on wooden pole lines does not materially improve line operation; (3) insulator breakage can be greatly reduced by use of more sturdy units; (4) systematic study and careful analysis of field investigations and records of operations and troubles, together with intelligent interpretations of summaries and final analyses, result in a great improvement in system reliability and in better use of the investment.

It was concluded that the reliability being obtained from transmission lines of 110 kv. and over which are insulated to withstand severe lightning voltage indicates that it should be possible to build lower voltage lines giving a class of service not obtainable with designs ordinarily in use today.

A new design of post type towers for transmission service, the objective being a rugged, simple structure, not requiring special skill in erection, and having most valuable electrical characteristics together with low cost, was described by Percy H. Thomas, consulting engineer. The design is not sensitive to irregularities in footing conditions and is generally applicable where a horizontal arrangement of conductors is feasible. The tower consists of an overhead transverse bridge carrying the conductors and hinged at the top of the footings. Two or three intermediate towers are used to stabilize the towers. Transverse strength is secured by crossed internal ties and longitudinal stresses are taken up at the stabilizer towers by heavy guys in the intermediate towers and by the ground wire conductors, which transmit these stresses to the stabilizer towers. A wide base structure thus secured has substantially no resultant uplift on the footings, offering a very large saving in foundation costs. This saving, together with the reduced material and erecting costs and the great ease of adaptability to varying ground conditions, conduces to high economy.

Tests show value of fused grading rings

Exhaustive tests conducted in the laboratory and in field service and reported upon by H. A. Frey and E. M. Skipper of the Locke Insulator Corporation indicate that the minimum short-circuit current which the fused grading shield, using a double-ended expulsion fuse, can be expected to clear satisfactorily is about 200 amp. The maximum short circuit which can be cleared has not been determined, but it is in excess of 5,100 amp. In 28 tests there have been only two cases of failure to clear and both of these were

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30,000 HP. MORE FOR THE ST. MAURICE

During the coming summer an additional 30,000-hp. unit will be installed in the 120,000-hp. La Gabelle plant of the Shawinigan Water & Power Company on the St. Maurice River in Quebec. The construction of a storage dam on the Mattawin River, a large tributary of the St. Maurice, makes this new power available.

with currents under 200 amp. Operating records show that out of a total of 113 operations on modern assemblies in service there has been only one failure to clear with consequent damage to line insulators and four cases of flashover within the substation. If the fused grading shield is applied to the reduced insulation at the line terminals and the gap between the fuse tip and shield adjusted to give the desired flashover voltage, then the excess voltage on the line will be relieved without an outage, since the power current to ground is interrupted by the fuse without operation of the line relays. Unlike the lightning arrester, the fused grading shield can take care of only those surges whose magnitude is sufficient to arc the gap.

Humidity chief enemy of air capacitors

Investigation of the phase defect angle of an air capacitor was reviewed in a paper by Prof. W. B. Kouwenhoven and C. L. Lemmon of Johns Hopkins University. The inquiry was undertaken to determine whether or not the known sources of atmospheric ionization suffice to account for phase defect angles and to study the effect of humidity and temperature upon the behavior of air capacitors. A special guarded shield test capacitor was constructed. Readings were made of continuous conduction current and the phase angle of this capacitor was compared with that of a standard air capacitor in which the humidity was maintained at a low value. It was found that the conduction was zero and the phase defect angle less than three seconds. For values of humidity below 90 per cent the authors concluded that the normal ionization of the atmosphere is not sufficient to produce a measurable phase defect angle in alternating-current measurement and commercial frequency involving an air capacitor as a standard.

Other papers presented covered refinements in electrical machinery design and advances in electrical measurements, communication and education. A new portable oscillograph was described in a paper by C. M. Hathaway of the General Electric Company. The device is but 16 x 10 x 9 in. over all and weighs but 27 lb., including a film holder which can be readily attached for photographic work. W. B. Kirke, Brooklyn Edison Company, presented a paper on the calculation of cable temperatures based upon duct bank researches in the New York district and C. L. Kasson, Edison Electric Illuminating Company of Boston, spoke on measurements of various kinds of rubber cable, looking toward a broader analysis of dielectric characteristics.

About 300 members and guests attended the four-day program. In all, 27 papers were presented.

WELDING A CRYSTAL SPHERE?

This General Electric workman is electrically welding a seam for the tank of an unusually large oil circuit breaker, but the camera has caught a most unusual effect. Welding continues to supplant other fabricating methods with an insistency born of sheer merit.

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Cheat River Project Again Considered

HEARINGS have been resumed by the Public Service Commission of West Virginia upon the question of granting a permit to the West Virginia Power & Transmission Company, a subsidiary of the American Water Works Company, to develop a series of water-power projects on the Cheat River. Opponents appeared to protest against the issuance of the permit on the ground that the grant would be too extensive and monopolistic and that the Legislature had not fixed the royalty provision to be paid the state at a sufficiently high figure. Representatives from the district where the company contemplates its developments urged that the commission permit the development to proceed without delay. (ELECTRICAL WORLD, page 379, February 22, 1930.)

Among those opposing the project at the resumed hearings was former Gov. A. B. White, who objected to the compensation feature of the power bill which fixes the annual royalty to be paid the state at $10 per 100 hp. It was also Mr. White's contention that the water power would displace 12,000,000 tons of coal annually.

"You are committing an economic crime against West Virginia if you grant this permit," Mr. White told the commissioners and Gov. William G. Conley, who sat with them at the hearing.

▼

North American Company Next Federal Trade Job

INQUIRY into the affairs of the Electric Bond & Share Company and its affiliated organizations by the Federal Trade Commission closed last week. All the witnesses were of the commission staff, though counsel for the utilities joined in conferences which shaped the course of the hearings. Evidence is not yet ready on the third Bond & Share group, the National Power & Light Company.

Looking ahead, it appears that the commission will take at least two more years in completing its utility hearings. Though no definite announcement has been made, it is thought that field examination will take at least another year and that the introduction of evidence into the record will continue for a year beyond that. The next group to be probed is that of the North American Company, on which hearings are scheduled to start about Monday, May 26.

Muscle Shoals Action Awaits House Debate

PROSPECTS are favorable for the early passage by the House of the military affairs committee Muscle Shoals bill, possibly amended. This new bill, bearing the name of acting Chairman Reece of the committee, seeks to supplant the Norris plan and to provide for leasing the properties as reported last week (page 916). The House is to consider it on May 20.

Old political observers still are dubious over the possibility of an agreement between House and Senate during the current session of Congress or even during the present Congress. This view prevails over the more optimistic outlook of some proponents of the bill who think that the Reece plan, which they view as a sensible settlement, will prevail because of its apparent soundness.

A report explaining in detail the theory underlying the Reece plan was released on Monday by the House committee on military affairs, stating, "Your committee feels, in view of the complex political atmosphere surrounding Muscle Shoals legislation, in view of the many conflicting interests with respect to it, and in view of the impossibility of prognosticating future industrial processes, that the proposed legislation for the disposition of the United States properties at Muscle Shoals is the very best that can be formulated. It believes, further, that its enactment into law will result in benefits to agriculture, the development of industries, the improvement of navigation, and, in short, added impetus to an already initiated industrial era."

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P. G. & E. Permitted North American Stocks

PROGRESS toward the great Pacific Coast merger is being made. The California State Railroad Commission has granted the Pacific Gas & Electric Company authority to issue 1,825,000 shares of its common stock, par value $45,625,000, to acquire controlling interest in Great Western Power Company, San Joaquin Light & Power Corporation and Midland Counties Public Service Company, in conformity with agreement of March 29, 1930.

Pacific Gas & Electric Company will acquire 62 per cent of Great Western, 57 per cent of San Joaquin, and all of Midland stocks. The commission confined its order to acquisition of stocks mentioned, holding that subsequent consolidation steps should be ruled upon as plans develop.

Power Means Prosperity for the Nation, Says Sloan

"SINCE the steady growth of this nation's industrial progress consists in the circulation of wealth through a prosperous people and healthy business structure," M. S. Sloan, president of the National Electric Light Association, told the joint convention of the Southwestern Division, N.E.L.A., and Arkansas Utilities Association in Hot Springs, Ark., last week, "it has been and must continue to be the part of the electrical industry to supply the power whereby a large part of that wealth is created. The effects of mass production have been so widespread as to be lost sight of as such, yet a condition that conduces to mass production was found to be inherent in mass production itself. The production of goods can increase only as wages are higher than living costs. America's industrial leaders maintain the policy of paying wages according to production. When the worker's producing capacity was increased by several horsepower of electrical energy he was able to earn higher wages. He was able to spend more for goods and services."

Merchandising and load building occupied the major attention at this convention, supplemented by policy and cus-

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SIGNING THE CONTRACTS FOR BOULDER DAM POWER

*Representatives of three consuming interests recently contracted for the output and operation of a planned government-owned Boulder Dam (*ELECTRICAL WORLD, *page 869, May 3, 1930). Here are J. B. Miller, chairman of the board Southern California Edison Company; Northcutt Ely, representing Secretary Wilbur; W. P. Shitsett, chairman of the board Water District, and John K. Haynes, president Board of Water Commissioners, Los Angeles.*

tomer relations discussions. Among the prominent speakers were: Martin J. Insull, president Middle West Utilities Company; J. D. Kennedy, president Central & Southwest Utilities Company, and P. S. Clapp, managing director N.E.L.A. About 600 registered for the meetings.

New officers elected were: President, H. C. Couch, Arkansas Power & Light Company; vice-presidents, M. T. Walker, Southwestern Gas & Electric Company; B. E. Eaton, Mississippi Power Company; S. R. Bertron, Houston Lighting & Power Company; S. E. Wolff, Oklahoma Power & Water Company, and Frank M. Wilkes, Arkansas Power & Light Company.

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Cities Service Offers Record Issue of Rights

WHAT is assumed to be the largest single issue of rights ever offered shareholders by a power and light company is announced this week in the Cities Service Company offering of $120,000,000 of 5 per cent convertible debentures. These rights have a present value of over $42,000,000. Holders of Cities Service common have the right to buy $100 principal amount of the new issue for each 25 shares held. Rights must be exercised and debentures paid for by June 16.

▼

Senate Passes Couzens Federal Power Bill

WITH the Senate passage on Monday of a bill to reorganize the Federal Power Commission, one of the power panaceas bearing the name of Senator Couzens finally has mounted the first hurdle of legislative achievement. Not to be confused with the "big bill" seeking in effect the federal regulation of the entire power industry, this reorganization bill simply provides three full-time federal power commissioners.

Though apparently innocuous, it violates two important principles advocated in the past by the electric industry and by most competent observers familiar with the situation. The commission not only is full-time but independent, which many fear, on the basis of past governmental experience, will permit the growth of a large and unwieldy bureau making needless demands on the industry. The second principle thrown into the discard is that of employing the existing field forces of the three executive departments now interested in carrying out the provisions of the federal water-power act.

The administration, by the action of three departmental secretaries last week, seems to have flatly dropped its opposition to these points. Senate passage was with no significant debate and without even a record vote. Leaders in the majority party expressed their entire satisfaction with the bill and foresaw no obstacle to House acceptance during the current session. Representatives of the electrical industry have been silent during this stage of the proceedings.

Interstate consideration held to not affect electricity rates

Legal opinion as to the constitutional basis of power legislation was given before the Parker power bill committee last week by Paul Shipman Andrews, special Assistant Attorney-General of the State of New York. The main point of the testimony, backed by ample reference to court decisions, was that railroad rates are subject to federal regulation simply because they represent a transport cost. Electric rates are a selling price, in which the cost of interstate transportation is only a small factor, and thus electric rates are not subject to federal regulation under any Supreme Court ruling as yet laid down, the witness declared. The courts, he said, have not yet sought to regulate the selling price of any commodity simply because it moves interstate. Therefore, it was contended, Congress cannot constitutionally fix the selling price of interstate power.

AND NOW——BASEBALL AT NIGHT

—Wide World Photos

Fifty million candle power was used at Des Moines, Iowa, early this month to usher baseball into the growing list of sports which need no longer be abandoned when the sun sets. More than 10,000 spectators are said to have viewed the first game. About 190,000 watts was supplied from 1,000-watt lamps variously placed. The installation cost approximately $20,000.

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Reform in Regulation Urged for Oregon

"THERE is an existing abundance of evidence in Oregon," according to H. H. Corey, senior member of the Public Service Commission of that state, "indicating that our regulatory laws should receive a thorough going over and be brought up to date, both in the interest of the public and the utilities."

"I hold," says the Commissioner further, "for the enactment of an amendment containing an 'indeterminate permit' provision, such as is found in the Wisconsin law and considered by the people of that state to be the very foundation stone upon which the regulation of utilities is based.

Utilities and public both viewed as beneficiaries

"Furthermore such a permit would give the utilities the following advantages: (a) They (the operators) receive what in effect is a perpetual franchise; (b) are relieved of the necessity of providing an amortization fund; (c) are assured of a fair price in the event their plants are purchased by the municipality within which they operate.

"On the other hand, a permit of this character would be of great benefit to the state in general by rendering possible the mandatory avoidance of cut-throat competition, and by giving the municipal governments the power at any time to purchase the public utilities within their boundaries at a fair and just price."

Red Seal Plan Wins Award for S.E.D.

WITH six years of development behind it and a record growth in 1929, the "Red Seal Plan of Adequate Wiring" received national distinction this month when the Society for Electrical Development, Inc., was awarded honorable mention as a trade association by a picked jury of business executives headed by Secretary of Commerce Robert P. Lamont.

The jury which weighed the plans from 36 trade associations was appointed by the American Trade Association executives to determine those most deserving of commendation because of their public as well as industry service. In the Red Seal plan the society was found to be in sponsorship of a program that—like those plans of four other associations receiving honorable mention—"breaks new ground, raises the level of association effort a little higher, or sets a new standard of co-operative achievement."

The jury of award which made the citations was composed of Secretary of Commerce Lamont, chairman; Merle Thorpe, editor *Nation's Businesss;* Owen D. Young, chairman of board General Electric Company and Radio Corporation of America; Walter Dill Scott, president Northwestern University; Leonard P. Ayres, vice-president Cleveland Trust Company, and Walter C. Strong, publisher Chicago *Daily News.*

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Doherty to Build Four Skyscrapers in New York

CONSTRUCTION work on the first of a series of four skyscrapers for the financial district of New York City will begin at once, according to an official announcement by Henry L. Doherty & Company. This 63-story, $15,000,000 structure will be erected on the block bounded by Pearl, William, Pine and Cedar Streets. The first nineteen floors will be occupied by Henry L. Doherty & Company and Cities Service Company. The present 26-story Doherty headquarters at 60 Wall Street will be joined to the new building by a bridge.

Among the novel features plannel for the new building will be double-deck elevators which will take on and discharge passengers of two floors at the same time. Escalators will serve the first seven floors. Artificial ventilation will be used throughout. The other sites now owned by Henry L. Doherty & Company will be developed later.

British Official Urges Co-ordinated Development

"ELECTRIC POWER," declared Herbert Morrison, British Minister of Transport, "is of such vast importance to the nation that you cannot allow the industry to be carried on haphazard or recklessly for individual gain and profit. This miraculous force, which can be used for such diverse and beneficial purposes, must in the end be organized for the nation by the nation in the interests of all classes and all types of industry and transport."

Mr. Morrison was speaking in Edinburgh after he had started up the Central Scottish section of the British national electrical grid (ELECTRICAL WORLD, page 921, May 10, 1930). Having explained the economic advantages which were expected to result from the national grid system, Mr. Morrison said: "The act of 1926 was based upon the doctrine that the past freedom of local authorities and companies to control their own plants in their own way was uneconomic and wasteful; that capital, whether privately owned or publicly owned, must be regarded as a national asset; and that it was not merely competent for, but the duty of, the state to enforce the economic use of industrial capital.

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CALIFORNIA—? HERE WE COME!

N.E.L.A.'s convention headquarters for 1930; San Francisco's civic center. Official meetings of the 53d convention of the National Electric Light Association will be held in the $2,000,000 Exposition Memorial Auditorium, at the left, which contains eleven halls seating from 400 to 10,000 persons each. The imposing building on the far side of the square is the City Hall. A splendid program has been arranged and association officials anticipate an attendance of more than 4,000. June 16-20 is the date.

"So far as I am concerned, I stand for the rapid, wherever advantageous, electrification of industry. I am a believer in the electrification of frequent suburban railroad services."

▼

Boulder Dam Awaits Appropriation Approval

ACTION upon Boulder Dam awaits a favorable report by the House committee on appropriations on the $10,660,000 requested by Secretary Wilbur and approved by the Bureau of Budget. Hearings will start next Monday, May 19. Meanwhile the Interior Department has been busy along lines related to the project. An area of 4,212 square miles tributary to the reservoir has been temporarily withdrawn from settlement and is being studied with a view to its use from a broad national viewpoint. It is expected that part will be set off as a national monument or other special preserve under the National Park Service. The 110-mile lake to be formed by the proposed Boulder Canyon reservoir is thought to possess great potentialities. Tourists will be attracted, it is believed, by the dam itself, by the lake, and by the possibility of safe boat trips to points of scenic interest in the Colorado River gorge.

Objections to suggestions of Colorado Board increase

A serious objection to the proposed increase of 25 ft. in the height of Boulder Dam has been advanced by Lewis W. Douglas, Representative-at-Large for Arizona. The change recommended by the Colorado River Board of Engineers and Geologists (ELECTRICAL WORLD, page 824, April 26, 1930) would, he declared, drown out the site of the Bridge Canyon project upstream, thus ruining a potential power and irrigation development nearly as important as that which would be created by the erection of Boulder Dam. Other competent engineers interviewed in Washington, including men familiar with the situation who favor the Boulder Dam project as a whole, agree that such a step would be an engineering and economic mistake and in direct violation of national policy as set forth in the federal water power act.

"What has happened," according to Mr. Douglas, "is that the project, ostensibly a flood protection scheme for the Imperial Valley, has been loaded with so much power that the dam height formerly planned did not leave sufficient storage capacity for floods. Any added height is for this political reason and has no engineering excuse."

According to reports of the U. S. Geological Survey, Bridge Canyon offers one of the most promising sites on the Colorado River. Estimates give a low-water capacity of 300,000 hp., or, with storage and ultimate irrigation development, a continuous 600,000 hp. The reservoir would back up to Grand Canyon National Park. The interest which Arizona people are taking in this project indicates that it is not necessarily a job for posterity. Though limited in storage, it is considered a good power site and diversion point from which water could be sent by a gravity line to Los Angeles.

"That the Bureau of Reclamation acted under Mr. Weymouth to save the Bridge Canyon project for future use by keeping down the Boulder Dam level is a plain admission that upstream development would be materially damaged by a higher crest," concluded Mr. Douglas. "I see no reason for an unexplained recession from this stand."

DALLAS SPRAY POND COOLS 53,000,000 GAL. DAILY

—Wide World Photos

When the new $2,500,000 extension adding 25,000 kw. to the capacity of the station of the Dallas (Tex.) Power & Light Company was recently placed in service a spray pond, covering 357,000 sq.ft., with a daily capacity of 53,000,000 gal., and said to be the world's largest, was placed in operation to cool the condensing water. Total capacity of the plant is now 82,500 kw.

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Municipal Plant Bids Sought by Jackson, Tenn.

CULMINATING point in a municipal light and power fight of two years duration appears to have been reached with the announcement by Mayor Lawrence Taylor that the city of Jackson would receive bids on May 28 for construction and equipment of a municipal plant to cost $500,000.

The announcement follows a break in negotiations with the West Tennessee Power & Light Company, which furnishes current for both light and power plants here. The city of Jackson has been contending for Memphis rates. It is said that the power company made concessions, but declined to meet the Memphis base.

The authority to construct the plant was given the City Commission by a large majority in a municipal election several months ago.

Northwest Acts to Avert Another Power Shortage

BOTH Seattle and Tacoma, remembering the embarrassing emergency of last fall when the municipal power systems failed to meet the demand without help from the government and private industry, are making provision to avert a power shortage in the late fall and early winter of this year.

Up to this time the Tacoma municipal system has relied almost wholly on hydro-electric plants, holding out the cost of emergency steam facilities to permit lower rates than those charged by fully equipped private systems. But last year's unexpected drought crippled the municipality's hydro-electric plants and forced Tacoma to obtain help from the aircraft-carrier *Lexington*. The unlikelihood of again obtaining the help of a battleship, has led the city to make a substantial outlay for a steam plant capable of producing 25,000 kw. Construction of the plant is being hastened so it will be ready to serve in the event of another pinch.

Tacoma-Puget Sound Power & Light agreement pending

Tentative approval of a reciprocal agreement for power service between the city of Tacoma and the Puget Sound Power & Light Company has been given by the City Council. The one-year contract has been referred to the corporation counsel for drafting.

The company agrees to furnish the city a maximum of 20,000 kw. The rate for hydro-electric power will be $0.005 per kilowatt-hour and for steam-generated power, $0.008 if the Renton plant is running, or $0.01 if necessary to start a new unit.

Utilities Commissioner Ira S. Davisson said the agreement will protect Tacoma until the second unit of the Cushman project and the steam plant are completed.

Seattle also will build a steam reserve

Likewise Seattle, while resentful of reports that the municipal power system failed last fall. is rushing steam reinforcements. It is true that Seattle's municipal system was not crippled by the drought as badly as was the Tacoma municipal system, but also it is true that Seattle had to obtain power from several manufacturing concerns and to call on the municipal customers to curtail the use of electricity—the shortage resulting in a dimming of the downtown district. In any event it has been decided to build a new steam plant, the city light department having ordered machinery for a supplemental plant to produce 10,000 kw.

In the meanwhile, Seattle is puzzled and worried by the prospect of another summer-fall season of insufficient water. Winter and spring rains in the Seattle area have been below normal, and there has been a sub-normal fall of snow in the Cascades. In fact, officials and weather observers, after checking up on the records, are wondering if there has been a great change tending to lessen the rainfall in the Puget Sound country. Generally, Seattle's rainfall annually is in the proximity of 36 in. In 1902 it totaled 45 in. But in 1929 the precipitation dropped to 20 in.

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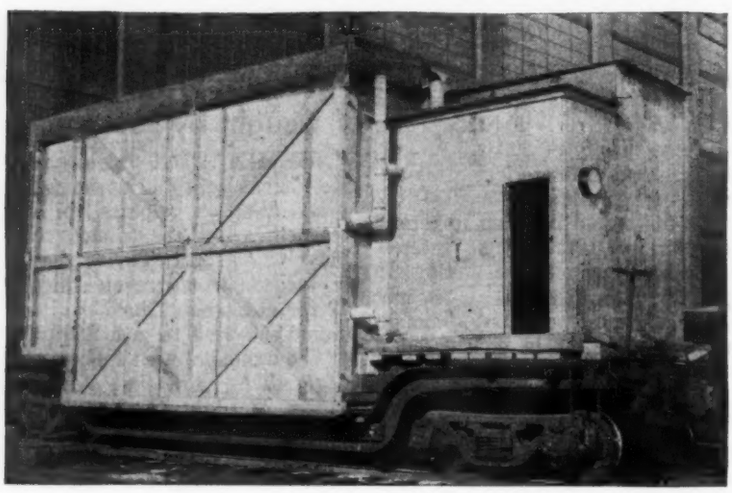
HEATED TRANSFORMER CARS SAVE TIME



Shipment of cores and windings for two large testing transformers from Pittsfield, Mass., to Schenectady, N. Y., was recently made by the General Electric Company while an ambient temperature of 90 deg. F. was maintained. A small steam-heating plant, coal burning, and quarters for the fireman were needed. Bake-outs were eliminated by maintaining the windings warm and dry.

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Rural Service Ordered by Several States

DECISION of wide importance to rural sections in Ohio served by power lines built at the cost of subscribers was handed down last week by the Ohio State Utilities Commission.

Construing the law in a case originating in Trumbull County, the commission held that a power company which provides a line extension at the request of and at the expense of a limited number of subscribers must furnish service to other applicants regardless of whether or not they agree to share in the cost of the extension. Pennsylvania-Ohio Power & Light Company was the utility involved in this case.

Alabama orders utilities to defend rural charges

It is the duty of all electric utilities in Alabama, in the opinion of the Public Service Commission, to extend their service lines into rural territory at their own expense when it is economically possible.

The commission has just issued an order citing all electric companies in the state to appear, either by representatives or by written statement or brief, on June 2 to show cause why the commission should not prescribe reasonable rules and regulations governing electric extensions to serve rural customers.

The commission states that it will, after proper investigation and hearing as required by law, establish a standard code of rules and practices governing utilities in the construction and operation of extensions for light, power and domestic service to rural customers.

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Paper Mill to Use All Utility Company Energy

THE New England Public Service Company is to supply, largely from its Bingham hydro-electric plant, all the electrical energy requirements of the new Bucksport, Me., paper mill of the Maine Seaboard Paper Company, according to recent reports. By-product generation of energy for use within the plant has not been adopted here since the paper mill and power system are affiliated and full capacity is available without new construction.

Coming Meetings

National Electrical Manufacturers' Association — The Homestead, Hot Springs, Va., May 18-23. E. H. Hubert, 420 Lexington Avenue, New York.

Public Utilities Advertising Association —Washington Hotel, Washington, D. C., May 20-21. J. T. Quinn, 2 Rector St., New York.

East Central Division, N.E.L.A.—Hotel Statler, Cleveland, May 20-23. D. L. Gaskill, Greenville, Ohio.

National Electrical Credit Association —Hotel William Penn, Pittsburgh, May 22 and 23. F. P. Vose, 140 South Dearborn St., Chicago.

National Electrical Wholesalers' Association — Hot Springs, Va., May 26-30. E. Donald Tolles, 165 Broadway, New York.

American Electrochemical Society — St. Louis, May 29-31. C. G. Fink, Columbia University, New York.

North Central Division, N.E.L.A.— Managerial Section, Alex. Johnson Hotel, Rapid City, S. D., June 11-12. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Canadian Electrical Association — Manor Richelieu, Murray Bay, Que., June 11-13. H. M. Lyster, 405 Power Bldg., Montreal.

Pacific Coast Division, N.E.L.A.— San Francisco, June 16. S. H. Taylor, 447 Sutter St., San Francisco.

National Electric Light Association— San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

Association of Iron and Steel Electrical Engineers — Broadway Auditorium, Buffalo, N. Y., June 16-20. John F. Kelly, Empire Building, Pittsburgh, Pa.

World Power Conference—Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Building, Washington, D. C.

Wisconsin Utilities Association — Accounting Section, Eau Claire, June 19 and 20; Electric Section, Lorain Hotel, Madison, July 17 and 18. Commercial Section, Green Bay, July 31 and August 1. J. N. Cadby, 105 Wells St., Milwaukee.

American Electric Railway Association —San Francisco, June 21-26. Guy C. Hecker, 292 Madison Ave., New York.

American Institute of Electrical Engineers—Summer convention, Toronto, June 23-27, F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials —Haddon Hall, Atlantic City, N. J., June 23-27. C. L. Warwick, 1315 Spruce St., Philadelphia.

Association of Electragists International—Hotel Schroeder, Milwaukee, August 18-20. L. W. Davis, 420 Lexington Ave., New York.

International Association of Electrical Inspectors—Northwest Section, Bellingham, Wash., Aug. 25-27. F. D. Weber, 414 Lumbermen's Bldg., Portland, Ore.

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500 Miles of Transmission Line for Saskatchewan

SASKATOON will be the center of much of the construction planned by the Saskatchewan Power Commission for this year, indicated Premier J. T. M. Anderson, in an official announcement outlining the initial program of construction of power transmission lines. The work, it is estimated, will cost approximately $2,000,000. Lines radiating in three directions from Saskatoon, together with a long line northwesterly from Moose Jaw and other lines included in the 1930 program, aggregate upward of 500 miles of construction. The program represents the beginning of the Saskatchewan Government's proposals for transmission of electric power throughout the province.

In announcing the work to be carried out this year, Premier Anderson declared his belief that the government's policy of selling power at cost would permit the Power Commission to undersell private companies in the field.

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Potomac Development Commission Appointed

APPOINTMENT of a Potomac River commission to negotiate with Maryland, West Virginia and the federal government in an effort to bring about an amicable agreement for the development of the Potomac River and the allocation of its benefits has been made by Gov. J. G. Pollard of Virginia. It includes R. Walton Moore and Thomas R. Keith of Fairfax County and former Gov. Harry Flood Byrd. Governor Pollard will be an ex officio member.

The commission is authorized to hold meetings and conferences in or out of the state with accredited representatives of the federal government and the states involved. The Governor was empowered by the General Assembly, when it created the commission, to designate engineers to investigate and report upon engineering problems or questions involving available dam sites for flood control and the creation and distribution of hydro-electric power. A meeting of the commission will be called immediately, Governor Pollard said, for the election of a chairman and secretary.

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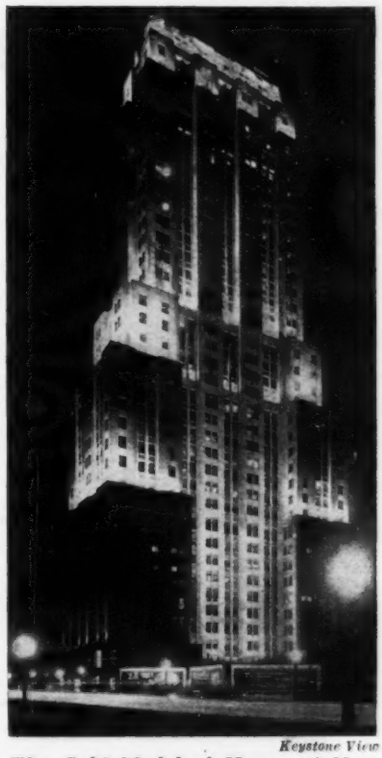
West Kootenay Power Wins Pend Oreille Decision

THE Water Board of British Columbia has delegated to the West Kootenay Power & Light Company the right to proceed at once with surveys for the construction of a 150-ft. dam near the mouth of the Pend Oreille River. The company already has the right to a 155-ft. dam further up the river. This second concession virtually gives the company control of the stream. Objections which had been filed by the Reeves McDonald Mining Company were overruled (ELECTRICAL WORLD, page 920, May 10, 1930). Opportunity will be given to the latter company, however, to file further objections when both plans are submitted.

EFFECTIVELY LIGHTED



Keystone View

The Gold Medal of Honor of New York's Architectural League was recently won by Chicago's new Palmolive Building. The Windy City is doing some extensive and interesting work in floodlighting its office structures.

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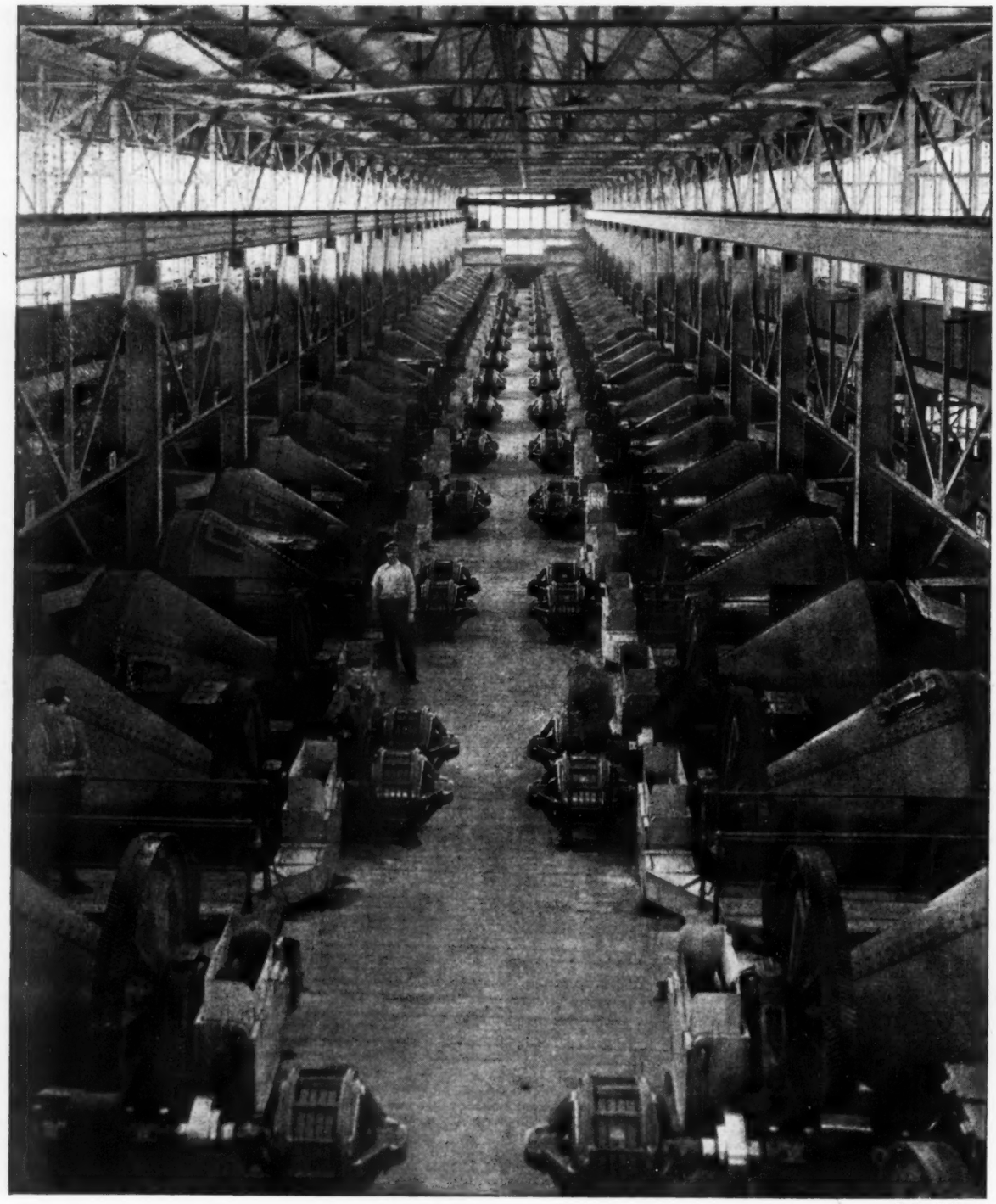
Utility Branch Offices Taxed as Chain Stores

BRANCH stores conducted by the Georgia Power Company for the sale of electrical appliances constitute a chain of stores and as such are subject to the chain store tax, according to a decision by Judge E. E. Pomeroy in the Fulton Superior Court.

The power company applied for an injunction against the comptroller general to restrain him from collecting the tax, maintaining that it operated several branch stores throughout the state, not as stores in the accepted sense of the word, but as places conducted for the convenience of the public, and the electrical fixtures and supplies sold at such establishments were for the sole purpose of increasing the consumption of electric current.

The state maintained the power company was liable for the chain store tax of $50 per store for those in excess of five, asserting the company sold all kinds of electrical equipment for profit. Judge Pomeroy denied the application for an injunction.

COPPER MILLS REGRIND ORE-BEARING ROCK, ONCE REGARDED AS WASTE



Ewing Galloway

EDITORIALS

L.W.W. MORROW
Editor

A Drawn Battle Results

THIS year of grace 1930 tenders us an interim decision on a rate case that has been dragging its tenuous form through courts and commissions since 1919. Telephone users in New York now know what their next bill will be based on and are complacently content with the small favors expediently granted by the commission. But not a soul is convinced that the rates are right and that the sound economics of the situation have not been obscured utterly by a welter of legal importunities and machinations. The typical telephone user has no appreciation of the individual factors in the hopelessly complex regulatory problem as now before us. Nevertheless, there is ample evidence of his awareness of the factors which are jousting for a controlling position.

Politicians greedy to capitalize disaffection as an issue, financial manipulators similarly acquisitive, utility managers trying to do an honest job effectively, agitators seeking to dissect and reassemble our institutions, business looking for a stabilized adjunct to its forward movement, consumers in general, eager to have peace and comfort—these are the factors that determine rate cases.

But not a single participant in the whole carnival has been able to propose rules of the game to which any of the other parties will subscribe as the acme of economic justice to all. On we go, fumbling for an expedient that will appease rather than cure, but making little effort to get at the seat of the disaffection, and every one, in moderate good nature, saying, "It's a mess, but why care." Fortunately the power industry has had enough perspicacity to sense most of the jumble and offer to its public a degree of self-imposed regulation that wins confidence, at least to the extent that no enthusiasm is aroused for senatorial inquisitions or trade commission explorations. The atmosphere is one of truce and non-combativeness, but there is no ground for believing that the treaty has established the foundation for permanent peace.

Let the Utility Take Up the Slack

AN INDUSTRIAL group planning to engage in a promising line of productive enterprise is likely to be so enthusiastic about the prospects of profitable growth and assured stability as to overlook the fluctuations in business that prevail in all industries. So many industries can be cited which have grown by leaps and bounds, meanwhile suffering only minor depressions, that attention is not focussed on the necessity of making investment earn its keep over a long period. These industries often present temporary operating conditions which appear to justify local power production rather than the purchase of utility power. The disposition of the power companies has been to be notably fair in recognizing these conditions yet to try to advise the most economical procedure for the long-term period of business activity.

What of the period when curtailed absorption of the product necessitates curtailed production? The plant that could find economic justification for the installation of a 5,000-kw. turbine because it needed its 120,000 pounds of steam per hour for process purposes may find that indefinite operation on a four-day week may fail to earn the carrying charges. The power company is, in general, in a position to have its diversified load absorb the ups and downs of individual customers. In this present period of industrial indecision and

lassitude, more than at any other time, it behooves industry to weigh all the factors affecting the purchasing or making of power. The power companies are peculiarly able and willing to take up the slack.

Guiding Progress in Industrial Electric Heating

STEADIER control of developments in industrial electric heating is apparent in engineering circles responsible for progress in this field. The electrical industry is rapidly getting away from the boom era in heating sales policies. The industrial heating schools of the past few years under N.E.L.A. auspices have contributed not a little to this attitude. Naturally, emphasis has been laid in the curricula upon the achievements and potentialities of electricity, but these intensive courses reveal the vital importance of adequate preparation before attempting to prescribe apparatus and methods for solving industrial problems in this way. This year's pre-convention school program scheduled for Los Angeles and San Francisco stresses successful applications, but fundamental principles will be set forth in a way to guide power sales engineers to sound practice after they return home.

Recent discussions of heating engineers in informal gatherings bring out live interest in such topics as core baking, vitreous enameling, fire protection, high-frequency heating, gray iron melting, so-called "short cycle annealing" and the limitations and possibilities of the arc furnace in the aluminum casting field. The competitive possibilities of so-called "bottled gas" have begun to press for advance consideration, although the present price spread between bottled gas and electric service appears too great to give the electric power companies much concern until the volume of sales of such gas rises to a point where installation and operating expenses can be greatly decreased.

Electrical manufacturing research is a powerful ally to heating development along sound lines and the open-minded viewpoint which now leavens utility sales organizations in heating promotion work and follow-up analyses of installations is doing a great deal to stabilize the advance.

Electrical Yardstick for Building Obsolescence

THE adequacy of electrical facilities in the modern office building measures the economic life of the structure. Financial houses that handle building mortgages are giving keener scrutiny to this fact, and speculative builders and renting agencies are finding it more and more necessary to provide adequate electrical facilities if desirable tenants are to be secured and if financing is to be done on a favorable basis.

Recent surveys show that the most potent influence upon office building obsolescence is found in inadequate wiring, inadequate elevator installation and inadequate lighting and ventilation. A building designed for a 100-kw. electrical installation finds it necessary to have 500-kw. facilities, perhaps, and either this is impossible of attainment or the change can be made only at great expense.

The facts about these conditions are creating a very positive pressure upon architects and builders to bring about provision in initial building design that will give modern electrical facilities and permit of expansion in the future. Some day the homes of the country will respond to a similar economic influence, provided home dwellers insist upon corresponding electrical service values.

Company Loyalties Are Built Around Personalities

A UTILITY offers to its employees, particularly those in operating departments, steady jobs immune from the ups and downs of business and industry. The average man likes permanence of employment. Imperceptibly there grows in him a real affection for the organization that is solid enough to give him this assurance. It is natural, then, that the loyalties of employees should center upon one man or upon a few men who by kindly nature, friendly personality and, above all, absolute fairmindedness are fitted to be the foci of other men's affection. Such men are few, but the electric utility industry has been blessed by having more than its share of them.

This reflection arose directly from the privilege accorded to an ELECTRICAL WORLD editor of attending a dinner-meeting of the operating department of the Commonwealth Edison Company of Chicago. This meeting, one in an annual series, was projected as an occasion for the renewal of personal contacts between executives and supervisors of the department and for the recital by them of the accomplishments of their divisions during the year past. The meeting had that purpose, prosaic enough and common to all others of its kind, when the arrangements for it were first started. But as the plans took shape another element came into being spontaneously and, without affecting the arranged program in any way whatever, reached full flower at the meeting. This element was the affectionate regard felt by all of the men in the operating department for their "boss," W. L. Abbott. This could be felt, although it was not expressed in words. It could be seen by the imaginative eye as the prevailing spirit of the gathering. It was evident even in the statistics that were read upon the work of the various divisions during the year. It was omnipresent and all-pervasive. So long as the electrical industry continues to fill many of its executive positions with men who inspire loyalty of this kind there can be no question of its integrity and solidity.

Remove the Flicker

A CHIEF source of expense and vexatious complaints in utility systems comes from the flicker of the electric lamp. This marvelous device has little or no thermal capacity and gives visual annoyance and instantaneously poor illumination due to sudden voltage changes. Despite good voltage regulation on a system, voltage flickers are to be expected in greater degree as more motors and heavy-duty devices are used in homes, in office buildings and in industrial plants. Starting conditions, cyclic vibrations, sudden load changes and other effects cause brief voltage changes that bring about flickers in the lights.

Despite improved starting devices for these applications and the use of these devices at great cost and despite the admirable qualities of the present lamp it would seem desirable to give a great deal of study to flicker elimination. As a first approach the possibilities of the lamp itself should be studied. There may be opportunity to increase the thermal capacity of the lamp by use of alloy filaments, some other metal for filaments or some better gas for filling the bulbs. At first thought this approach would seem hopeless as a research project, yet many things have been done that appeared impossible and researches, not opinion, should exhaust the possibilities of this approach. The problem is important and deserves study.

What Kind of Farmer Uses Electric Service?

"IT COSTS me less to get repairs on electrical equipment than it does for repairs to my wife." This is the justification offered by one progressive farmer to the critical remarks of others who thought that he was spending altogether too much money for farmstead equipment.

Standing alone, the statement is a cold-blooded one, taking into account as it does only the economic status of the farm wife, but there are too many farmers who do not think of the situation even in that apparently heartless way, and the result is that the lives of unnumbered farmers' wives are shortened and made dreary by drudgery that can be lifted from their shoulders.

The farmer who uses electric service is thus one who thinks and analyzes. He is also one who is receptive to new ideas, searches for them in the literature of farm operation that is available to him. This conclusion is borne out by the subscription list of the magazine *Successful Farming*. In 1925 14 per cent of the farmers who read this magazine used electric service. In 1929 the proportion had risen to 25 per cent.

Supporting evidence for this conclusion is found in the sales records of a manufacturer of milking machines. Five years ago only 30 per cent of the milking machines sold by this company were electrically operated. At the present time 66 per cent of them are driven electrically. This shows that the farmer progressive enough to want a milking machine is also one quick to appreciate the value of electricity in his business.

Securing Reliability and Economy in

By ALEX B. BAILEY*

Superintendent Generating Stations
Commonwealth Edison Company

THE foundation for carrying the load a year from now or five years from now is being laid today. The reliable and economical performance of our electric supply systems stands, not upon snap judgment and quick decisions, made on the spur of the moment, but on study in advance, with a full understanding of the conditions to be encountered and the equipment to be operated.

IN THIS paper Mr. Bailey gives an intimate picture of the underlying technique of plant and tie-line operation on the great system of the Commonwealth Edison Company, emphasizing the vital importance of load forecasting and allocation to insure the metropolis of the Middle West the highest grade of economical service.

NIGHTMARES of drudgery, sweat and profanity—such were the week-ends in the earlier days of central-station service in many large cities. Saturday nights, Sundays and holidays were the only times when machinery could be spared for extensive repairs, and nervous tension alternated with relief as peaks came and went. The present picture is entirely different, as improvements in equipment and organization have pushed the old scene into the background. The responsibility of those in charge, however, has increased immeasurably and customers are demanding a quality of service previously undreamed of. Good operating results are impossible with a poorly designed or poorly constructed plant. Given good design and construction, the operating force must then use proper discretion, foresight and technical care in order to obtain reliable and efficient service.

Since coal is the raw material for electrical production in our steam plants it is absolutely necessary to have, first, a reliable supply, and, second, at as low a coal cost as possible. As a consequence, the company interested itself many years ago in coal properties in the central and southern part of Illinois which are operated under its direction, and at the point where the coal output is the greatest it has a short railroad connecting these mines with trunk line railroads entering Chicago.

As we are distant from our source of supply and dependent upon other railroads than our own for fuel delivery, it is very necessary for us to carry a considerable amount of coal in storage. Each station has a yard storage capacity of from 45,000 to 160,000 tons, depending upon its site, and in addition we have a yard at Glenn, just outside of the city, of 300,000 tons capacity, from which point coal can be delivered to any of the stations. The amount of reserve ordinarily carried is between 40 and 60 days' supply, but in case of impending trouble at the mines or on the railroads, or at the beginning of winter when fuel shipments are uncertain, this amount is generally increased. With this coal reserve we feel reasonably safe, as the tracks in the station yards are our own property and we operate our own locomotives for switching purposes.

At present there are no increases being made in the generating capacity within the city, but considerable increases are going in at Waukegan, Powerton and State Line and a new plant is being built at Michigan City. Each of these will be a large generating center which will wholesale power to the connected companies. These stations are interconnected, and are further connected not only with the Commonwealth Edison system and its generating plants but with other large systems such as the American Gas & Electric, to the east, and the Milwaukee Electric Railway & Light Company, on the north. We are purchasing power from all three of these stations in varying amounts.

Commonwealth Edison Company system

About 83 per cent of our output is generated in our own stations located inside of the city. Interconnections transmit power from the most economical plants to points of load density and facilitate not only the economical production of power but afford reserve for operating emergencies.

The economical operation of the system is a responsibility second only to service. The output of the system must be divided between the various generating stations, whose outputs vary from 50,000 to 7,500,000 kw.-hr. daily and whose performances vary from 30,000 B.t.u. per kilowatt-hour to 13,000 or less. It is necessary to

**From an address before the Boston section of the American Society of Mechanical Engineers.*

in Metropolitan Service

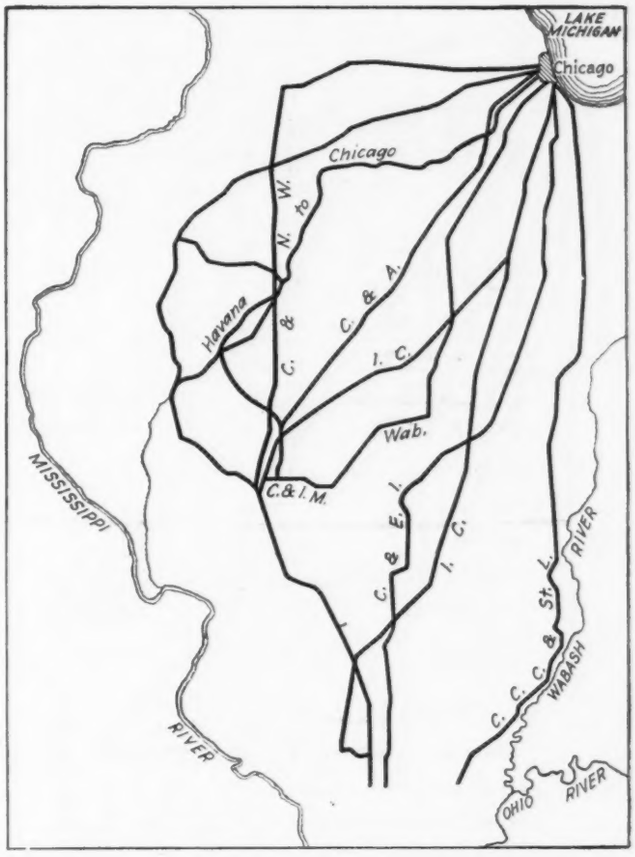
operate with a loading schedule which will result in the lowest over-all system production cost and at the same time insure reliable and adequate service.

As it is impossible for any man or any group to keep in touch with load conditions from minute to minute and regulate the load which a particular station should carry, and as it would be equally impossible for any operating organization to operate economically under such haphazard loading, the loading schedule for the stations is made out in advance so that the operators in each station will know how much load they should carry under given conditions. This schedule of load is the foundation of both reliable service and economical performance, as the correct division of the system load is based on the knowledge of each individual unit's performance over its entire capacity range and the relation of each unit's performance to the system as a whole, with due regard to reserve capacity in generating units and tie lines.

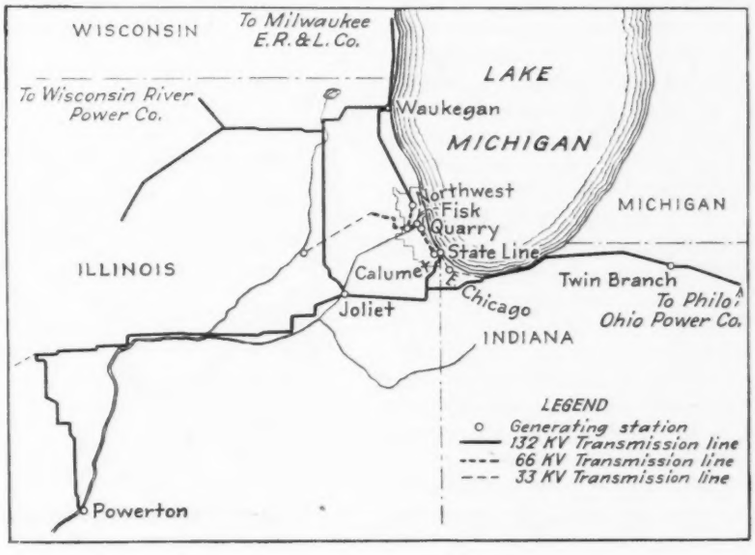
The output of each station is approximately determined a year in advance. In October or November an estimate of the company's output by months is made for the succeeding calendar year. The amount of energy to be purchased or to be sold and the shape of the load curves for these loads are quite accurately determined. With these deductions, we then determine the monthly output of our own generating stations.

From a study of previous years seasonal load curves are derived, showing the hourly loading on weekdays and on Saturdays and Sundays. From these the percentages of output on Saturdays and Sundays and on the five weekdays, which are generally quite similar, are determined as well as the percentage of load at each hour of the twenty-four. Using these percentages as a basis, the next year's estimate is divided up into output for the five standard weekdays and Saturdays and Sundays, and from the hourly percentages sample load curves are produced which show not only what the load will be at any hour of the day, under normal operation, but also what the peaks will be and when they may normally be expected. Four average curves are prepared, one for each season of the year, as there is a considerable variation in the amount of load between summer and winter as well as in the shape of the load curve. By deducting the curve for purchased energy from this total load curve the load curve for our own stations is determined.

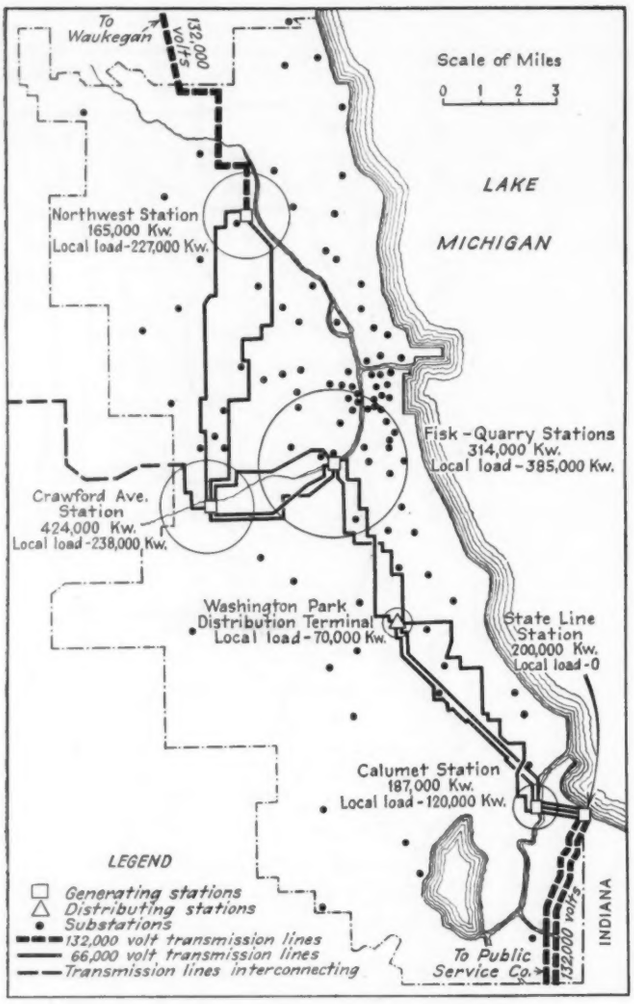
From this data the load curve for our most economical station is taken, giving it all the load it



Coal routes feeding Chicago steam plants



Major interconnections of Chicago district



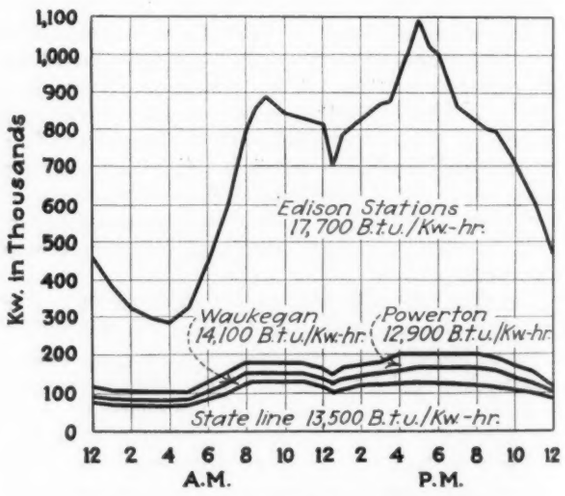
Commonwealth Edison plants and tie lines

can economically carry and keeping in mind proper operating reserve and the seasonal outage of units on account of overhauling. Following this, the load curve for the next best station is determined, and so on down the line. From these individual load curves the station outputs are figured, which are given to the organizations in the various stations for figuring their budget requirements. With the output and the character of the load curve given we are able to estimate quite accurately the fuel required and the labor and maintenance expense.

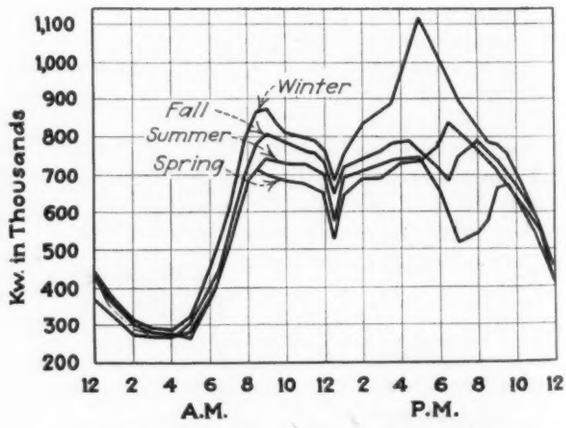
With these charts as a basis, operating schedules are prepared which show the proper loading of all stations with any addition of system load. As the schedules are prepared in advance and with due deliberation and study, we are able to determine also in advance what the overall thermodynamic performance of the system will be for any given loading and by studying the effect of load factor on any load schedule can determine the most economical manner of dividing the output.

The situation is somewhat complicated by the fact that we are operating two systems—a 25 and a 60 cycle. The former, which is the older, supplies the energy for the downtown d.c. district and the bulk of the power for the street and elevated railroads. The growth of this system has been retarded and practically nullified by decreasing the area served and by taking increases on the other system, and as a result no generating equipment has been added to this system for about ten years. Its most efficient units, therefore, operate at about 20,000 B.t.u. per kilowatt-hour. In order to get the benefit of the increased efficiency of the later installations, two 40,000-kw. motor-generating sets have been installed at Fisk Street. These supply bulk energy to the 25-cycle system from the more efficient 60-cycle generating equipment. Of course it is always necessary to keep considerable 25-cycle capacity in service for emergency, but this system is, in addition, fortified with storage battery reserve, and all of this capacity on the 25-cycle system is available to help out in case of trouble on the 60-cycle system. The motor-generator sets will feed in both directions, so that either system is in position to help the other.

In order to avoid complications, however, simple load distribution charts are made up for each system. These give the station loads to be carried for any system load. In order to make this operable, each station control center is supplied with a recording and indicating wattmeter, which shows the output of the entire system at any instant. By consulting this chart the operator can see at a glance how much load his station should be carrying at a given time and can adjust the load accord-



Unit economy at which Edison and purchased energy are secured



Seasonal variations in total Edison load, 1929

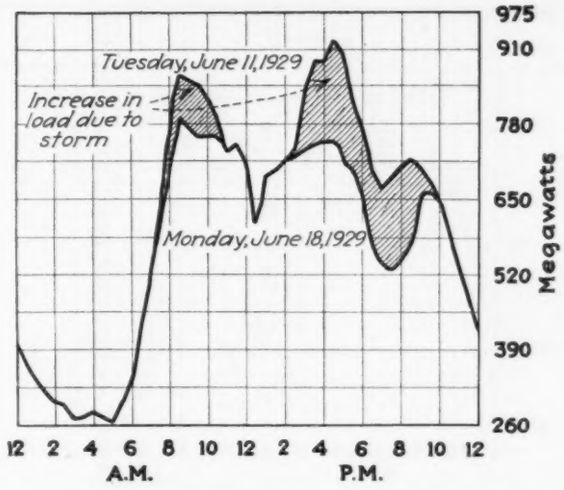
ingly. This immediately does away with any attempt to steal load from other stations under favorable steam conditions or to let go of load under adverse conditions and has a marked effect on the maintenance of uniform frequency.

At the load dispatcher's office, which is mainly concerned with the distribution of energy, is located an additional group of recording and indicating wattmeters which show the load on each station. By comparing these with the readings of the system totalizing meter the load dispatcher knows at all times whether or not each station is handling its share of the load.

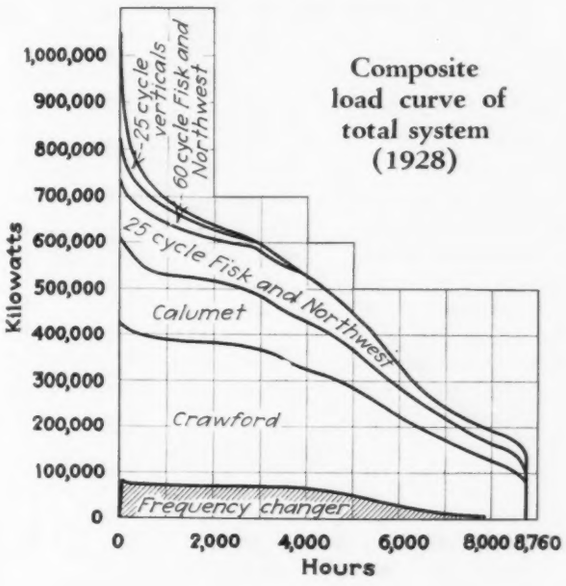
Most of our output is being generated at the stations where the cost is lowest, but the less efficient stations cannot be shut down altogether. We have not quite reached the stage of perfection where generating and transmitting equipment is absolutely infallable, and since we are serving large industries and customers whose service in turn demands an uninterrupted power supply we can take no chances. Consequently reserve is maintained at each generating center continuously, as interruptions frequently occur instantly, and the equipment must be in readiness to take care of such an emergency with equal rapidity. At least an hour is necessary to place one of the newer large units in operation and a service interruption of that duration would be disastrous.

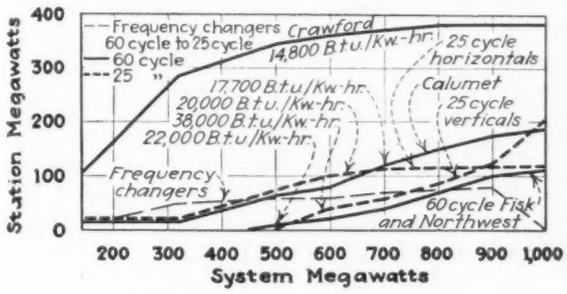
To guard against interruption of the service, such as low voltage or frequency, we normally maintain a running reserve equal at least to the load on the largest single generating unit. This is almost invariably greater than the load on any individual tie line or any individual piece of transformer equipment. In the case of State Line station, where there is a capacity of 200,000 kw. and of which we normally receive 120,000 kw. with a station loading of 160,000 or 170,000 or in the case of Waukegan or Powerton, where we receive lesser amounts, we depend on these stations to carry a proportional amount of running reserve which will be available in an emergency.

While it is advisable to carry as large a part of the running reserve on the less efficient stations as possible, it is physically impossible to pick up load quickly on lightly loaded and relatively cold equipment, so we carry 10 to 15 per cent reserve on the more heavily loaded and more economical stations. This, of course, applies to boiler capacity as well as to generating equipment. In an emergency we are able to draw a limited amount from our connections to the east and north or, in turn, our reserve is available to help them out in case of trouble on their systems.

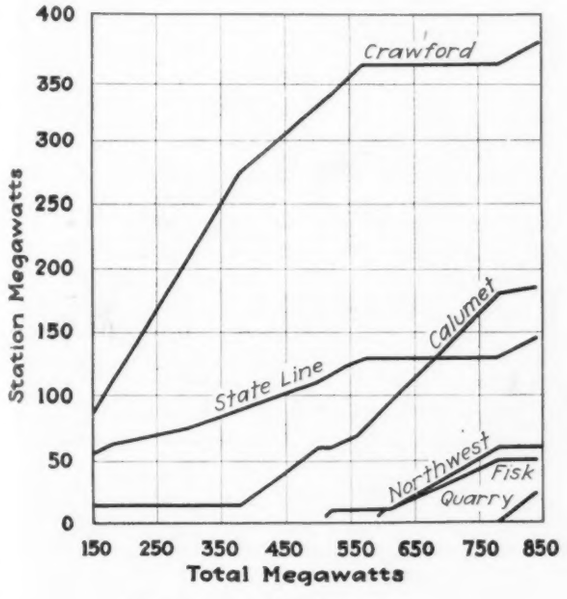


Effect of storm on system load

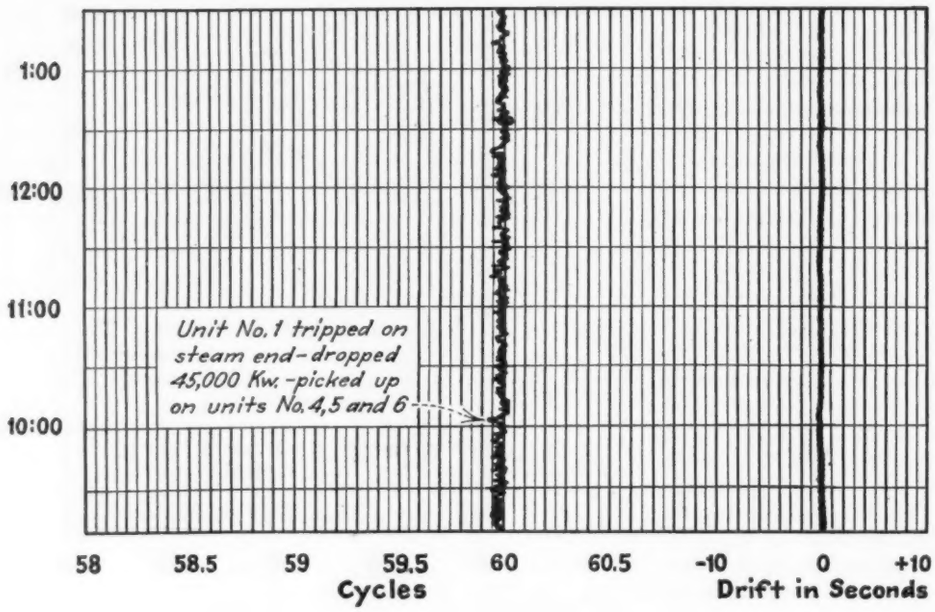




Division of system load



Sixty-cycle load division



Frequency closely regulated even when 45,000 kw. was dropped suddenly

It is an interesting fact that in the case of serious generating trouble in Wisconsin some time ago the Public Service Company, operating the Waukegan station, was able to assist materially in avoiding a serious shutdown by reversing the direction of flow of power between Chicago and Waukegan and drawing on our reserve in addition to what they could spare to help out in the emergency.

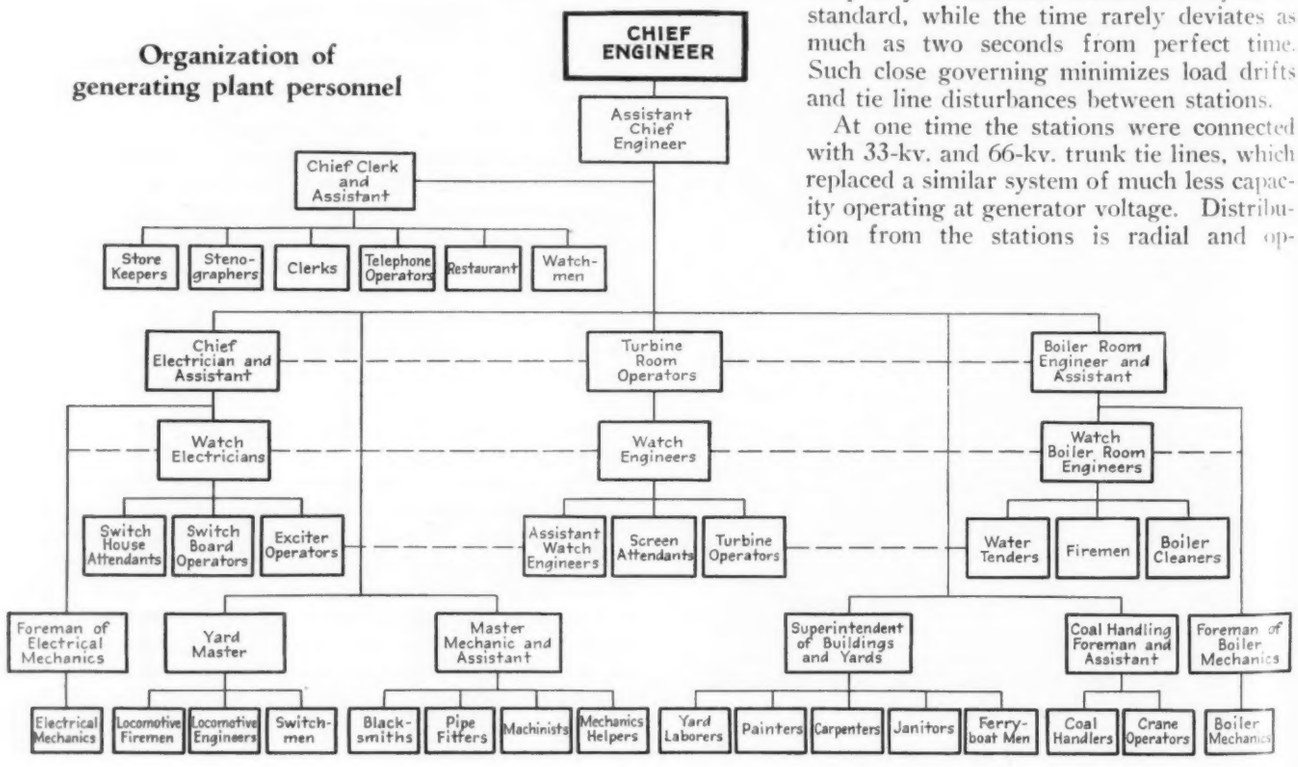
All emergencies that arise are not due to failure of equipment. Sudden storms effect increases in load which are greater in amount than those due to troubles with the equipment itself. What actually happened to the load on account of a thunderstorm last summer is graphically shown in one of the accompanying illustrations. The increase was not only excessive but the rate of increase necessitated almost instantaneous action.

Frequency control has been given considerable attention in the past few years. Up to that time standard frequency was a term which was frequently referred to, but which was realized by relatively few companies. The interconnection of large systems brought this subject to the front, however, and made it necessary for all those interested to improve frequency conditions. The improvement was indeed marked and automatic frequency controllers appeared in numbers. Many operating companies developed their own, as we did, and the results were exceedingly gratifying, to say the least.

A chart taken from the frequency recorder at a time when 45,000 kw. was suddenly dropped by one of the generating units shows not only the frequency of the system but the drift from perfect time as supplied by the U. S. Naval Observatory. It is now possible to operate for considerable periods with the frequency maintained within 0.05 cycle of standard, while the time rarely deviates as much as two seconds from perfect time. Such close governing minimizes load drifts and tie line disturbances between stations.

At one time the stations were connected with 33-kv. and 66-kv. trunk tie lines, which replaced a similar system of much less capacity operating at generator voltage. Distribution from the stations is radial and op-

Organization of generating plant personnel



erates at 12 kv., which is the generating voltage. The long transmission lines connecting the wholesale power centers are operated at 132 kv.

As an operating precaution, the generating station bus is sectionalized, in some cases with reactors, and lines to a given substation or to a large industrial customer emanate from more than one generating station. In all cases the lines may be connected to either one of two buses in such a way that either may be killed without interrupting the supply to the substation.

Further precautions were taken by equipping buses with relays so that in case of trouble the buses will be sectionalized and the trouble isolated.

The isolated phase type of bus construction has become standard practice in our newer installations. This is a purely protective measure, as it reduces the liability of phase-to-phase short circuit. It is very improbable that such a fault will ever develop, except possibly by the simultaneous failure of two pieces of apparatus on different phases.

The urge for greater protection and better regulation is resulting in the speeding up of circuit breakers so that they will clear cable faults within two cycles (one-thirtieth of a second) after the fault develops. On recent tests air breakers cleared short circuits within two cycles when the current value was 30,000 amp. at 12,000 volts, supplied by the main Chicago generating system.

Periodic testing essential to reliable operation

Periodic testing of equipment and the institution of regular schedules for inspection and overhauling have become almost standard procedure. With large units, such as those now in use, it is economically possible to install sufficient indicating and recording instruments to keep a very accurate check on the performance of an individual piece of apparatus and to detect very quickly and definitely any feature of operation which is out of the ordinary. While these devices do not tell the whole story, tests may be conducted from time to time, and in the case of turbines and generators they may be opened up for inspection at regular intervals.

Boiler equipment is taken out of service at regular intervals for cleaning and for the inspection of auxiliaries as well as of the boiler itself. These schedules are strictly adhered to in order to insure the safe and economical operation of the equipment. Such precautions have a marked effect on the reliability of the equipment.

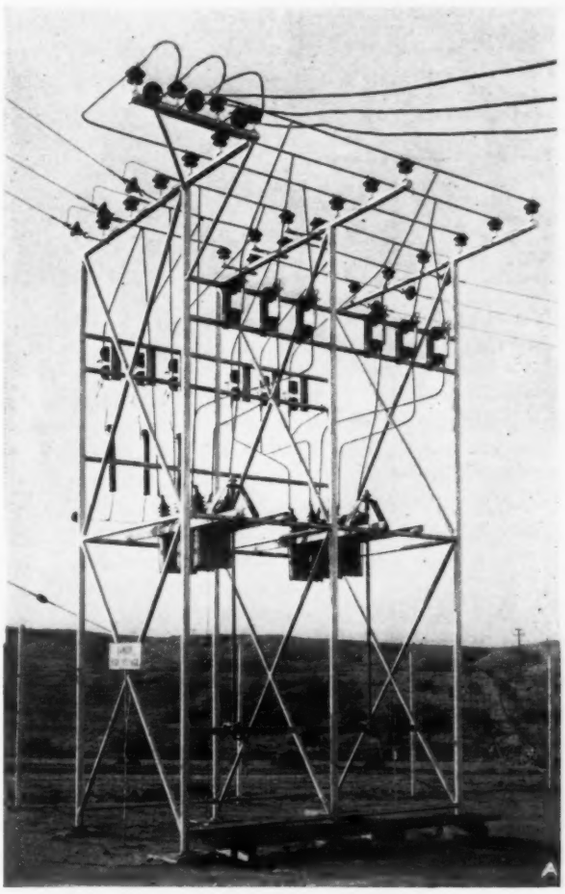
Periodic tests of feedwater, condensate, make-up, boiler water, lubricating oils and the countless details which go to make up station operation have each a place in the operating program. All of these make for reliable and economical operation.

Only three errors occurred in 88,500 switching operations

Due to the size of the system and the amount and complexity of the equipment to be handled, the opportunities for operating errors are numerous. However, despite the fact that there were more than 88,500 switching operations performed in 1929 on the station buses and high-voltage lines, in addition to those necessary for auxiliary power used in the stations, only three errors were made—none of them serious.

Welded Switchrack Built at Less than Cost of Fittings

IN THE fields of the Honolulu Oil Company, near Bakersfield, Calif., where a certain amount of scrap pipe is available, it has been found that a switchrack like the one illustrated can be built up from short sections of scrap pipe, electrically welded, at less than the cost of fittings alone where the usual method of construction is employed. By using a template laid out on the shop floor with pegs, one man can completely assemble and weld all sections in two days. The sections are then erected in the field and the ties welded in place. The total cost erected, exclusive of equipment, but including the insulator pins welded in place, does not exceed $75.



Welding eliminates fittings in this switchrack and permits use of scrap pipe

Such switchracks are used at various points in the field for distribution of 2,300-volt power. In addition to their very low cost they have the advantage that they can easily be added to, and another important feature, usually not given sufficient attention, is the elimination of the hazard of projecting bolts and fittings to catch workmen's clothes.

Steel Poles for Special Use

BASED upon the replies received by ELECTRICAL WORLD from 67 operating organizations in the electric light and power and railway fields there is no strong trend discernible in distribution engineering toward the substitution of long-life metallic poles for the virtually universal wood line supports.

Of the total of 67, 30 organizations reported using steel poles, of either the tubular or lattice types, and the remainder did not use steel at all, the use being largely dictated by expediency. Combination of street railway supply and street lighting and straight ornamental lighting standards accounted for most of the applications, thus:

	Total Users (30)
Joint railway, secondary and street lighting	4
Joint railway and secondary	2
Joint railway and street lighting	2
Joint street lighting and secondary	1
Railway	1
Ornamental street lighting	5
Secondary	2
Station risers	3
Special	4
Not specified	6

The actual extent of the use of steel proved to be, in proportion to total poles in service:

	Total Users (30)
Negligible	6
Negligible to 1 per cent	9
1 to 5 per cent	3
5 to 10 per cent	1
Not specified	11

The type of pole specified for use was given as:

	Total Users (30)
Tubular and lattice	5
Tubular	11
Lattice	1
No standard specifications	7
Question unanswered	6

Standard sizes adopted by utility organizations:

	Total Users (30)
Various	5
30 ft.	4
33 ft.	1
35 ft.	5
40 ft.	4
45 ft.	1
None	12
Question unanswered	5

There is no preference whatever for steel poles for general use, as 29 users voted "no" and one did not answer the question. Special uses required steel poles in the view of 25 engineers, four did not like them even then, although using, and one did not answer. Reasons for preference under special conditions appear as:

	Total Users (30)
Appearance and strength	5
Appearance and suitability for joint service	4
Appearance	7
Strength	2
Suitability for joint service	1
Civic demand	1
Appearance and civic demand	1
Railway use only	1
Miscellaneous	2
Question unanswered	6

In listing the reasons for the limited adoption of steel poles for low-voltage service the replies of both users and non-users have been combined and totals of reasons rather than number of users indicated:

	Total of Reasons (67 companies)
Poor insulating value	3
Hazard to workers	21
Failure to meet service conditions	7
Life not established	1
Difficult to work without special equipment	8
Stock room supplies increased	1
High cost of pole and installation	40
Appearance not considered	2
General satisfaction of work	9
Concrete poles preferred	1
Permanence not needed	7
Question unanswered	9

No trend toward underground distribution that could be called strong is discernible for these companies for the percentage of the facilities so located proved to be:

	Total in Each Class (67 Companies)
None	20
Negligible	11
Neg. 1.0 per cent	4
1 5 per cent	7
5-10 per cent	5
10-15 per cent	8
15-20 per cent	2
Upward to 20 per cent	4
Question unanswered	6

Of those organizations having underground service and giving reasons therefor the classification of replies shows:

	Total in Each Class
Civic demand and economic reasons	17
Civic demand (actual and anticipated)	16
Economic reasons	4
Legal requirements	1
Service continuity dictated	1

Wood is giving all-around satisfaction for general use because of its low first cost installed, safety factors and easy climbing. Decided and uncompromising opinions of several utility men to the effect that system changes are occurring so rapidly that the argument of longer life and permanence for steel poles lacked weight were expressed.

Hazard to workers and high cost are apparently the greatest obstacles faced by the steel pole. Neither of these objections is insurmountable for, as systems become better approximations of the ultimate, permanence and long life will assume an economic value which will offset higher first costs, particularly for ornamental street lighting. Hazard to workers is not desperately impossible of solution.

With wood becoming scarcer each year as stands are depleted and with the nation's resources dwindling to alarming proportions it does not require an undue imagination to foresee the necessity of using fewer wood poles in the future. As a matter of conservation of natural resources the higher costs of steel might lose considerable significance. Appearance, while important, is not likely to be a ruling factor except in ornamental street lighting, for, particularly in the densely populated areas, underground construction will probably negate the necessity for attractive supports for overhead construction.

Dispatcher's Board Uses Electrically Operated Targets

By J. H. SIEGFRIED
Superintendent of Power
Pacific Power & Light Company, Kennewick, Wash.

FEELING the need of a more up-to-date dispatching board to meet the needs of its large and rapidly growing transmission system, the Pacific Power & Light Company has devised and installed a board with several new features at its dispatching center at Pasco, Wash.

The new board is approximately 8 ft. x 10 ft. and was built on a 2-in. x 3-in. angle-iron frame carrying six panels of galvanized sheet iron. The whole is hinged to a wooden box of the same outside dimensions as the angle-iron frame. The face of the diagram is painted a dull black and the voltage of the lines is indicated by various colors. The inside of the box, which is approximately 12 in. deep, is painted with white enamel.

Instead of using small colored lamps to show the position of high-tension switches, a small two-colored transparent target is moved across a hole in the panel. By having lamps burning inside the box the color of the targets shows through the holes in the panel. Nine 40-watt lamps are located inside the box for this purpose. The targets are operated by small electromagnets and are so arranged that they indicate the normal position of the high-tension switch which they represent while no current is flowing through the coil. Current for operating these targets is furnished from a six-volt storage battery.

The targets are operated from the load dispatcher's desk by inserting plugs in a plug board exactly the same as is used in a telephone exchange. The only difference is that the plug is solid and short circuits the contacts when it is inserted. This allows current to flow through the coil of the electromagnet and operates the target.

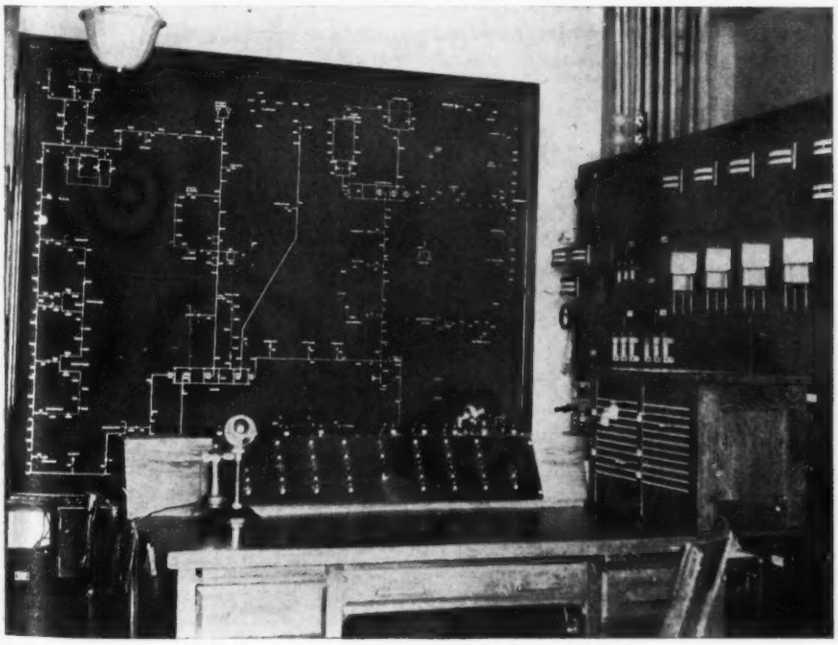
The advantages of this type of board are:

First—The position of switches is indicated by colored targets, which does away with the trouble experienced from burned out small indicating lamps.

Second—The lighting is provided from a separate source, and even though several of the lamps fail there is always sufficient illumination to allow the dispatcher to see the position of the switches.

Third—No current flows through the magnets unless the switch is out of normal operating position.

Fourth—The plugs inserted in the plug board give the load dispatcher an opportunity to check quickly what high-tension switches are not in normal position, and by referring to the plug board and then to the diagram a complete check of the position of switches can be made almost instantly in spite of the fact that there are some 400 switches represented on the diagram.



Remote control plug-in board enables quick change of main board indications

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Strip Type Heaters Keep Motors Dry

A NEW use has developed in the Pacific Northwest for industrial heating units which offers good sales possibilities for the manufacturer, additional load for the power company and a means of preventing motor troubles for the user. It has always been a problem to keep motors installed in damp places dry when not in use for a period of time. In such places as sand and gravel pits, rock and stone quarries, crushing plants and other outdoor or semi-outdoor installations motors frequently stand idle for weeks at a time.

To prevent accumulation of moisture and possible motor failure, the new metal-clad strip type industrial heating unit made by a large manufacturer is placed between the motor frame and the bedplate. A canvas is then placed over the motor to retain the heat. If a separate circuit is not run for the heater, the motor circuit is utilized by disconnecting two terminals of the motor. The units consume 500 watts at 220 volts and may be connected in series for 440 volts, or also may be so connected if less heat is desired at 220 volts. Cost of heaters is nominal and the current consumed is negligible as compared with motor repairs. There is little fire hazard involved, since the motors are usually outdoors.

Maximum Volume in Sales

Economic analysis to fix sales and advertising expenses in terms of volume of sales. Sales study follows market study

HOW can a manufacturer obtain a maximum volume at a justifiable sales and advertising expense? To find the answer each manufacturer must know definitely the market he is going to sell and must classify and analyze the markets so that every sales approach can be measured in terms of costs and returns. The application of this selective selling principle then involves a co-ordination of personalized selling and selling by advertising and direct mail. Intelligent analysis of facts permits of tangible records and measurement of results.

A manufacturer who has studied his distribution and sales problem contributes specific material that applied to his business when he approached and solved his sales problem in this manner. This was an old business that found itself in bad condition and no longer a leader in its field. New management was called in and an analysis of the situation was made. It found:

1. Manufacturing methods and equipment fair.
2. Product exceptionally meritorious.
3. Sales methods and organization far below par.

Sales records consisted only of an active customer list and an uncertain prospect list, although the company attempted to sell direct to industry. The new management improved manufacturing and made minor improvements in the product, but focused attention on sales.

The first step was to install a Kardex type of sales record system at the beginning of 1928. Each card gave a record of each customer and a history of each account. It showed the classes of equipment in each customer's plant, the age of the equipment, possibilities of customer growth and other salient data. These cards were classified by salesmen, by territory, by industry and by product and data were recorded on sales and lost business for each class of product manufactured.

This record was based on requiring accurate sales reports to be made.

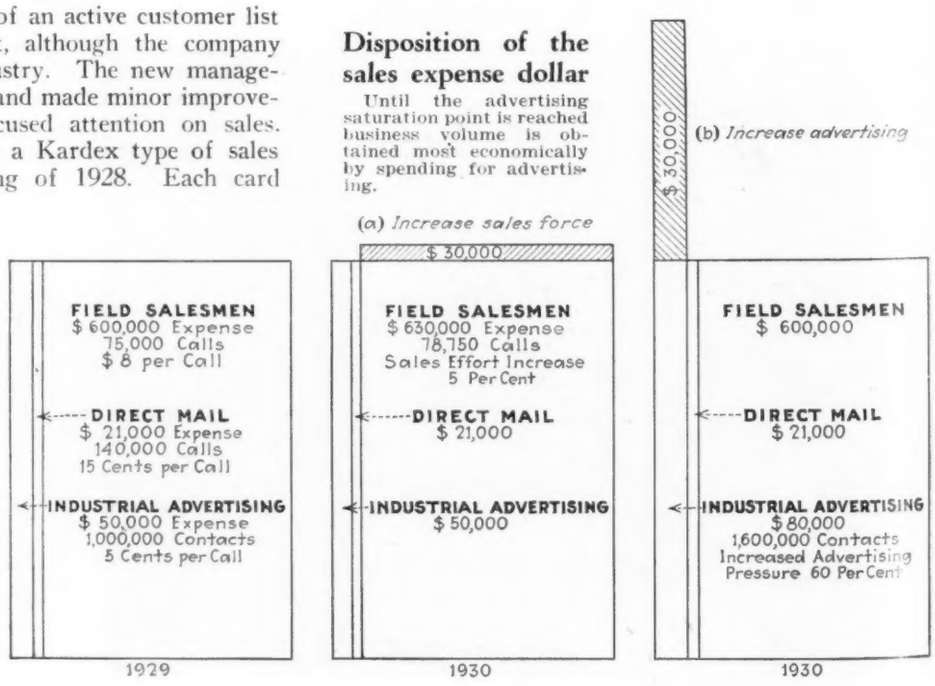
The next step was to study advertising. Before 1928 very little had been done and the new management immediately undertook an advertising and direct mail campaign as part of its program to increase sales and re-establish prestige. This campaign was set up by industries on a selective basis.

Thus 1928 was devoted to rebuilding the sales organization, establishment of sales records, building an advertising program and the development of a sales plan. The business results at the end of 1928 were encouraging and at the end of 1929 definite progress was indicated in that sales had increased 39 per cent over 1928. Over-all sales, sales costs and the per cent of sales expense to gross sales for 1928 and 1929 are given in the accompanying table. Salient items of this tabulation are as follows:

1. For field sales in 1929 $600,000 was spent. This accounted for 75,000 calls at an average of $8 per call.
2. Direct mail entailed a charge of $21,000; 140,000 pieces of direct mail were used at a cost of 15 cents per piece mailed.
3. For industrial advertising $50,000 was spent. This was the equivalent of 1,000,000 calls at a cost of 5 cents per call. The relatively high cost was the result of using inserts very largely.

Disposition of the sales expense dollar

Until the advertising saturation point is reached business volume is obtained most economically by spending for advertising.



Sales Volume and Expense for 1928 and 1929

	1928	1929
Gross sales	$3,900,000	$5,425,000
Total field sales expense	565,000	681,000
Ratio of sales expense to gross sales	14.5	12.46

These records of past performance and the sales record cards made it possible to study the problem of further expanding the volume of business. The evidence showed more business could be had and the problem was to determine how to get it. An estimate was made on the basis of business volume increase that was beyond the normal expansion to be expected with the existing advertising and sales organization.

An arbitrary sum of $30,000 was taken and studies were made to see how this could be spent to best advantage in increasing the sales volume.

Use of Salesmen.—The first thought involved the use of more salesmen. The $30,000 would permit salesmen to make 3,750 additional calls or give an equivalent of 5 per cent increase in personalized selling effort. On the basis of equal efficiency the new salesmen would produce $271,000 worth of business. Under this favorable condition a dollar spent would bring in $90 worth of new business.

Use of Advertising.—If instead of more salesmen, the $30,000 was spent for advertising there would result a possibility of making 600,000 more advertising calls per year. This would increase the advertising sales effort 60 per cent.

Since 1929 sales increased 39 per cent over 1928 with the existing sales and advertising it is fair to budget a 10 per cent increase in business for the existing sales force if they were backed by the additional $30,000 worth of advertising. This would mean $542,500 in new business over what could normally be expected from the salesmen operating as they had in previous years with the same advertising and direct mail assistance. Thus one dollar spent on increased advertising would bring in $181 in new business.

To recapitulate, the comparison between expending $30,000 for more salesmen or for more advertising is as follows:

More Salesmen

(a) Equal efficiency basis increases sales	$271,000
Gross volume of business	5,696,000
Over-all sales expense, per cent	12.46
(b) 80 per cent efficiency basis increases sales	$217,000
Gross volume increase	5,642,000
Over-all sales expense, per cent	12.59

More Advertising

A 10 per cent increase in present sales	$542,500
Gross volume of business	5,967,000
Over-all sales expense, per cent	11.89

The sales expense during 1929 was 12.55 per cent of the sales dollar. On the basis of budgeting 1930 by using advertising to increase the efficiency of the present sales force, the sales expense becomes 11.89 per cent.

The use of more salesmen, first, on the basis of equal selling efficiency with present salesmen, would give a 1930 expectation of 12.46 for sales expense and, second, on the basis of only 80 per cent selling efficiency in new salesmen, 12.59 per cent.

This analysis shows that the most economical method for getting increased business was through increasing advertising expenditures. The saving is equivalent to earning $39,385 on a gross of $5,967,500—a sum $9,385 over and above the amount invested for increasing the volume of sales.

There is a definite limit in the application of this principle. The limiting point is advertising saturation or the point at which increased advertising expenditures will increase and not decrease total sales expense. This point varies widely in industries and between organizations, but it can be fixed quite definitely by any organization in any industry if the method of analysis outlined is used and if the market and sales data are available to make the necessary computations. This "case" is cited to illustrate a principle and a method that may be valuable to any organization.

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Truck Tower Aids Assembly of Street-Lighting Structures

By R. J. DRAKE
Assistant Street Lighting Engineer
Public Service Company of Northern Illinois, Chicago, Ill.

IN THE assembly of street-lighting posts and fixtures in a large installation near Chicago the contractor made large use of labor-saving mechanical equipment. The use of perambulating ladders and towers is not new in the art of street-lighting construction and maintenance. However, the use to which the tower was put entitles it to some comment. As may be inferred from the accompanying illustration the truck carried complete materials and

Instead of the work being carried past the men the men are carried past the work, which is, of course, the same thing.

A working out of the mass production idea with reverse English

equipment for finishing post installations. While the men at the top were hanging the arm and installing the unit and its glassware another man was working at the base of the post connecting up the leads to the supply system. As the truck moved along the street it left behind it complete installations ready to go into action as soon as the current was turned on.

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Making Low-Voltage Industrial Circuits Safer

A TOTAL of 143 fatalities credited to accidental contact with low-voltage circuits under unfavorable conditions occurred in the summer of 1928, according to approximate data gathered by the National Safety Council. Fixed machines, switches and wiring in industry accounted for 59; extension lamps and cords, 43, and portable tools, 33, stated S. E. Whiting, assistant chief engineer Liberty Mutual Insurance Company, Boston, at the annual safety conference of the accident prevention committee, New England division, N.E.L.A. The necessity of making greater allowances for variations in the ohmic resistance of the human body was stressed by Mr. Whiting in studying conditions bearing upon electric shocks from low potential wiring. Referring to industrial wiring, the speaker said:

Special transformers will protect workers

"It will be appreciated that the present necessary practice of neutral circuit grounding on secondary systems, while eliminating the danger of high-voltage leakage, actually tends to increase the danger of low-voltage shocks, since only one contact with a live part is necessary to shock any one who himself is standing on ground. A practical advantage would accrue from using a special transformer of one-to-one ratio to feed the limited amount of power necessary for portable lights or portable hand tools in locations that are exceptionally hazardous in respect to grounding of the operator. The secondary of this transformer would be run insulated, thereby eliminating the neutral grounding that exists on almost all lighting circuits. The transformers for such service would be so small that they could themselves be of portable type and several such transformers are now available on the market. It would be possible, if desired, to go still further and utilize a transformer with a ratio of three-to-one so that the insulated secondary circuit could be operated at about 35 volts. For this purpose standard wiring would of course be entirely satisfactory and the lamp manufactured for car-lighting service could be utilized. This would further secure against the shock hazard by a double protection of reduced voltage and insulated circuit.

"This matter is mentioned, not as something new, but because there is the problem in any installation of electrical equipment of not only providing safe initial equipment, such as shock-proof lamp holders and high-grade extension cords, and the continuing problem of making certain that this equipment is being maintained in a safe condition. A striking illustration of this double-edged viewpoint of the low-voltage hazard, particularly in the use of portables, occurred in the vicinity of Boston about a year ago, in a small plant having only ten employees and occupied in a cleaning operation that produced constant dampness on the floor. First one of the employees was killed in using a non-standard brass socket extension lamp and this condition was corrected immediately after the accident. Rubber reinforced cords and non-metallic weatherproof sockets were substituted and a special narrow lamp cage was clamped onto the outside of the socket. Nevertheless, within five weeks of the first accident, a second man was killed in this same small plant. His death is probably to be ascribed to a defective lamp cage, one prong of which was inserted inside the lamp socket to hold the cage in place because the original metal clamp had been knocked off. The first death was due to substandard equipment and the second to inadequate maintenance. The change to a three-to-one transformer would have been a more reliable solution of this problem."

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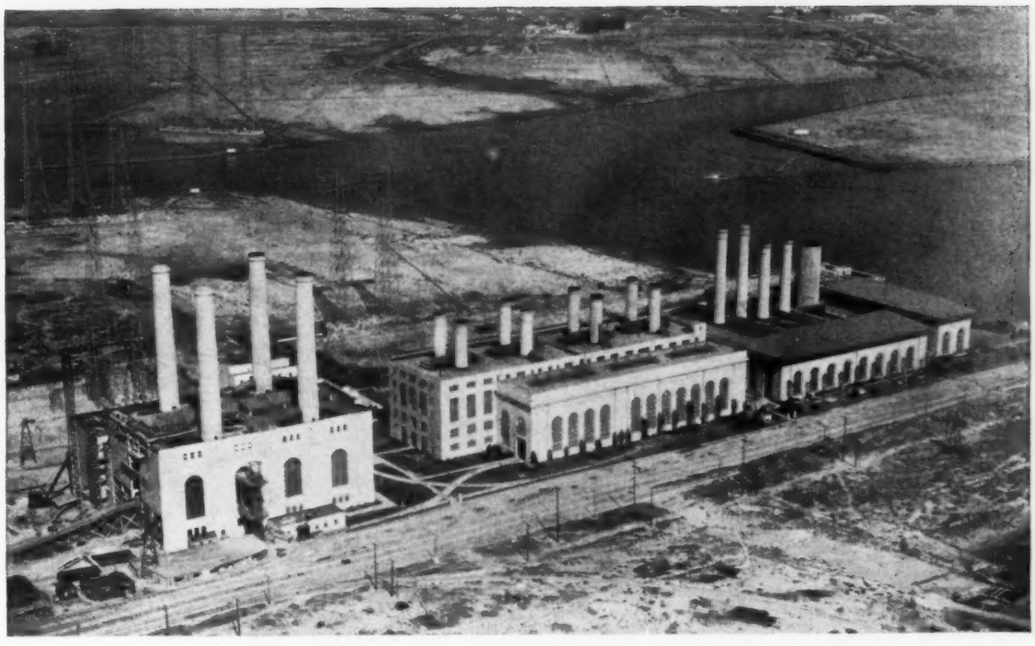
Long Beach Continues Its High Economy

SUPPLEMENTING the article which appeared in the May 18, 1929, issue of ELECTRICAL WORLD entitled "Long Beach Performance," F. G. Philo, superintendent of steam generation of the Southern California Edison Company, has prepared an operation summary for the year 1929 for unit 10, Long Beach Steam plant No. 3. It will be seen that this summary extends the summary published in the article referred to, giving a complete summary for this 100,000-kw. single-shaft, turbo-

OPERATION SUMMARY UNIT 10, COVERIN THE LONG BEAC STEA

	January	February	March	April	May
Gross kw.-hr.	73,646,600	65,437,300	64,072,400	46,312,200	2,221,
Aux. kw.-hr.	2,268,060	2,017,900	2,141,060	1,551,690	2,263,
Net kw.-hr. output	71,378,540	63,419,400	61,931,340	44,760,510	9,957,
Aux. percentage of gross	3.08	3.08	3.34	3.35	3
Mach. load fact. 90,000 kw. rating	106.60	104.86	92.49	69.07	104
Mach. load fact. 100,000 kw. rating	95.94	94.37	83.24	62.17	94
Net kw.-hr. per bbl. of oil	486.95	486.68	482.99	490.29	493
B.t.u. per net kw.-hr.	12,835	12,842	12,940	12,747	12,(
B.t.u. per gross kw.-hr. turbo-gen. extraction cycle	10,572	10,484	10,479	10,322	10,
Boiler efficiency	84.98	84.23	83.78	83.79	83
Steam pressure at throttle	402	405	402	407	
Steam temp. at throttle	718	721	724	726	
Feedwater temperature	358	341	363	377	
Injection water temp	57.1	56.4	57.0	59.0	6
Vacuum ref. to 30" Hg. Barometer	28.34	28.55	28.64	28.93	28

*Summary—January 1, 1929, to December 31, 1929.



Long Beach plant No. 3, at the left, houses the new units

generator unit from the time the throttle was first opened up to the end of the year 1929.

The average efficiency for the year, as shown by the accompanying table, was 12,848 B.t.u. per net kilowatt-hour, or, expressed in Pacific Coast parlance, 486.44 net kilowatt-hours per barrel of oil. This result was obtained using natural gas fuel supplied from nearby oil fields. The high hydrogen loss incidental to the burning of natural gas results in a lower station efficiency than is obtainable burning either oil or coal. Oil fuel was used only in one boiler during a series of boiler tests.

On January 11, 1930, this unit was shut down for the tie-in of the second 100,000-kw. unit in this plant. After the work of tying-in, which required approximately 24 hours, was completed the unit was again put on the line at full load. During the period of uninterrupted operation which preceded this shut-down the turbo-generator and the three 3,416-hp. boilers of this unit had operated continuously for 3,335 hours, generating 320,609,820 net kilowatt-hours. This was an average hourly load of 95,562 net kilowatts for the period.

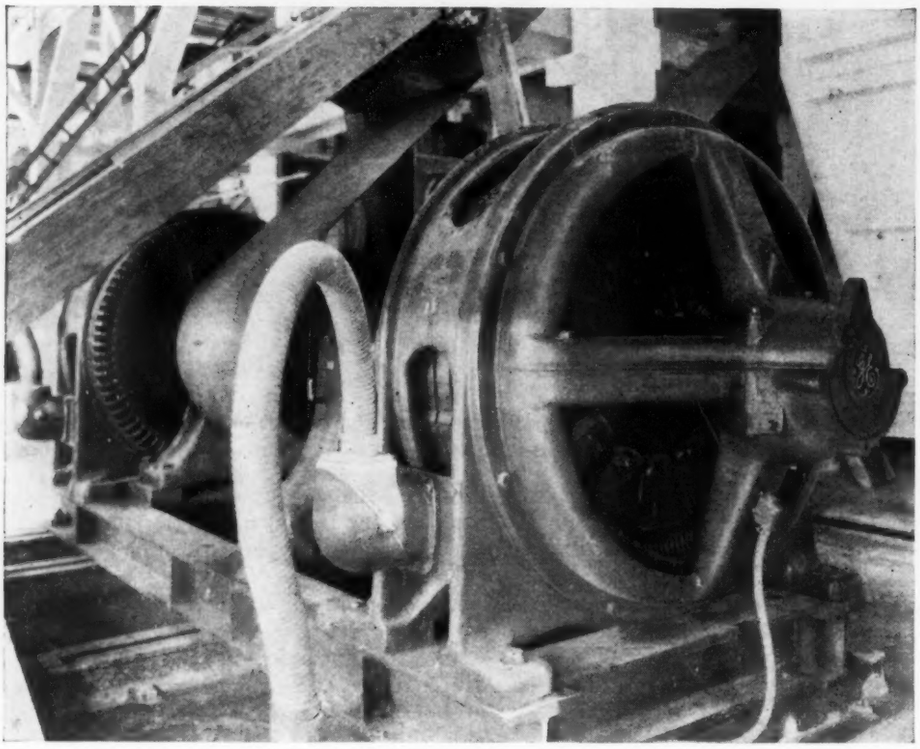
The second unit in this plant, to be known as unit 11, will also be of 100,000 kw. capacity and will be a duplicate of unit 10 in all important features, except the superheater, which will be of single-pass instead of three-pass design.

The output of unit 10 was 22.6 per cent of the total output of the Southern California Edison system, which amounted to 3,162,988,030 kw.-hr. for the year. The steam plants of the company generated 41.4 per cent of the total system output during 1929, or a total output of 1,309,522,170 net kilowatt hours, which was generated at an average over-all efficiency of 14,373 B.t.u. per net kilowatt-hour.

THE PERIOD FROM JANUARY 1, 1929, TO DECEMBER 31, 1929, INCLUSIVE,
STEAM PLANT NO. 3

May	June	July	August	September	October	November	December	Summary*
2,221,300	69,192,700	24,729,200	28,317,900	71,419,500	75,100,000	73,036,300	73,872,500	737,357,900
2,263,510	2,085,990	991,160	1,080,480	2,245,490	2,324,820	2,177,730	2,198,070	23,345,960
9,957,790	67,106,710	23,738,040	27,237,420	69,174,010	72,775,180	70,858,570	71,674,430	714,011,940
3.13	3.01	4.01	3.82	3.14	3.10	2.98	2.98	3.17
104.48	103.55	35.45	40.68	106.75	108.68	109.35	105.82	99.28
94.03	93.20	31.91	36.61	96.07	97.82	98.41	93.34	89.35
493.12	487.57	463.62	474.90	488.85	488.38	484.83	488.60	486.44
12,674	12,819	13,481	13,161	12,785	12,797	12,891	12,791	12,848
10,312	10,442	10,836	10,579	10,401	10,414	10,512	10,423	10,456
83.99	83.99	83.73	83.58	83.99	83.99	84.04	83.99	84.04
409	410	413	413	406	412	411	415	409
738	745	723	724	738	746	747	753	735
392	352	327	360	383	359	326	329.5	357
63.5	66.1	59.2	68.4	65.9	64.7	62.7	61.4	62.6
28.62	28.45	28.70	28.68	28.30	28.10	28.10	28.65	28.51

Sawmill Uses 22,794 Hp.



By A. H. ONSTAD*

Electrical Engineer
Weyerhaeuser Timber Company
Tacoma, Wash.

Dual synchronous motor drive on bandsaw gives two sawing speeds

THE advantages of electricity for the distribution of power in a lumber manufacturing plant, aside from that of fuel economy, were recognized as far back as 25 years ago. Prior to the adoption of electric power transmission a lumber plant had two or more complete power plants, each with its complement of boilers, engines, pumps, etc. There was a plant for the sawmill, one for the planing mill and sometimes one for the box factory or other side line or power user that could not be reached by belt or rope drive from the sawmill power plant.

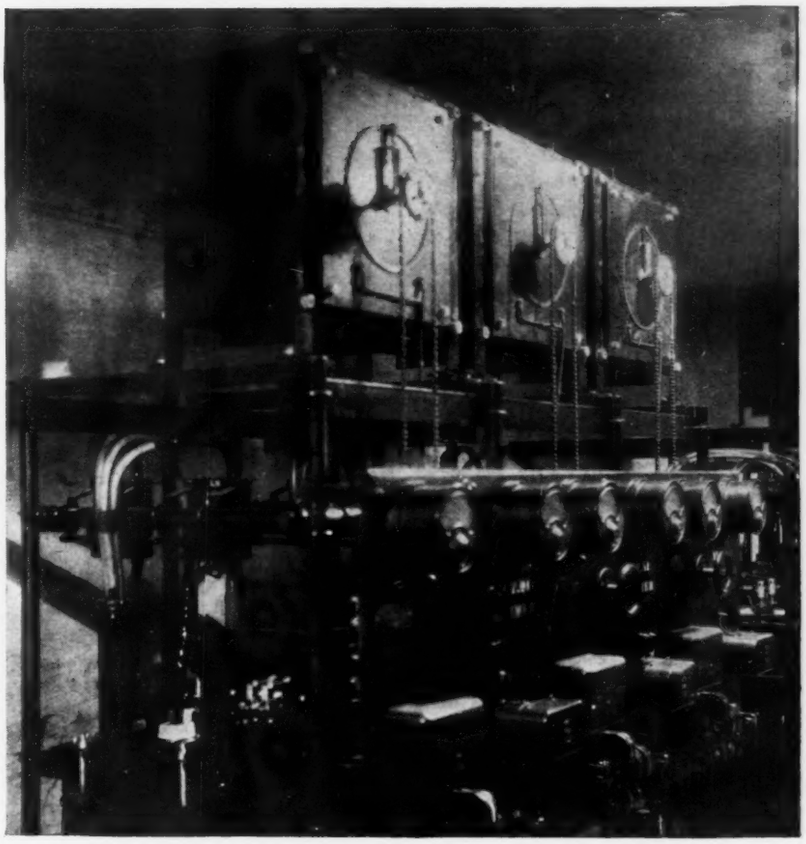
When considered only from the angle of fuel economy, electric power had no advantage over any other power as applied to the lumber industry, except in a few isolated instances, until within the last decade. The raw material of the lumber industry is one of the earliest fuels used, and is still used as such in large quantities outside this industry. Sawdust and ground-up mill refuse are usually sufficient for all power needs. Any excess wood waste must be burned in refuse burners, which are expensive to build and maintain and present many evils.

Development of the low-pressure and mixed-pressure turbo-generator, however, stimulated the adoption of electric power distribution. By installing a mixed-pressure turbo-generator in the sawmill power house, arranging it to take the exhaust steam from the sawmill engine, usually a Corliss engine, and all the steam from the many steam cylinders in the mill, enough power could be generated to run the planing mill and other departments without drawing on the boilers for any great quantity of live steam. The cost of installing the generating equipment, plus the cost of the electric drives in

ALMOST revolutionary changes have been made in the lumber industry in late years, points out the electrical engineer of one of the largest timber companies in the United States. He refers to selling surplus power to utilities and the latest ideas in sawmill power generation, the field for synchronous and induction motors, the importance of starting requirements and the value of automatic starting and stopping.

*Based on a paper presented before the Seattle and Tacoma Sections, A.I.E.E.

Grouped automatic full-voltage starters for synchronous motors



the planing mill, frequently exceeded the cost of a separate power plant for the planing mill, but the investment was justified by reduction of the operating force and lowered maintenance.

In all mills built in recent years and in mills converted to electric drive the steam engine has been entirely displaced by the turbo-generator or by purchased power. The only steam used, aside from that for prime movers, is for dry kilns, operation of the head saw log carriage and various lifting cylinders throughout the mill.

Changes being made in the method of lumber milling are steadily increasing the kilowatt-hour consumption per unit of finished product and the demand for process steam. These changes, along with the possibility of selling all surplus power to public utilities, or other power consumers, is placing a higher value on mill refuse, and instead of surplus mill refuse being a liability it now has a money value at many plants. With a contract for the sale of surplus power the mill can run its generating equipment at nearly 100 per cent load factor, and if it has sufficient power plant equipment it can turn all its mill waste into revenue. This has made it imperative that efficient power plant equipment be installed for the conversion of fuel into power; also that motor applications be made with a view to conservation of power as well as continuity of service.

One of the best examples of what this revolutionary process in sawmill power production and distribution has led up to is the recently completed mill of the Weyerhaeuser Timber Company at Longview, Wash. The generating equipment at this plant consists of two 7,500-kw., 2,300-volt turbo-generators. These turbines operate from steam at 300 lb. per square inch at the throttle, superheated to 580 deg. F. When operating at full load, 150,000 lb. of steam per hour at a pressure of 125-lb. gage may be bled from each machine for the dry kilns. Two 500-kw., 250-volt, direct-current generators driven by synchronous motors supply current for 27 cranes as well as current for other drives requiring direct current. They also supply exciting current for the synchronous motors. The load on the plant with its 22,794 hp. in motors averages 7,000 kw. By the use of synchronous motors as here applied the power factor of the load is 96 per cent leading.

There are 1,190 motors in the plant, not including motor-driven tools, such as portable drills and grinders, motor-driven electric welding sets, electrically driven clocks and motor-driven office appliances. These are divided as follows: Seventy-one 2,200-volt synchronous motors, 10,645 hp.; 30 2,300-volt induction motors, 2,875 hp.; 1,021 550-volt induction motors, 8,575 hp., and 78 220-volt direct-current motors, 1,754 hp.

SOME perplexing problems that have been solved are also discussed and methods of instantaneously changing saw speeds and regulating feed to edgers are explained. The field for high-speed motors is also increasing. Equipment used in felling trees is described. While the discussion refers to saw-mill applications, many of the ideas can be used in other industries.

Field of synchronous and induction motors

Synchronous Motors—The synchronous motors used range from 50 to 400 hp. and from 225 to 1,800 r.p.m. All of them are wound for 80 per cent power factor and have a pull-in torque of 100 per cent of full-load torque. Automatic, full-voltage, across-the-line starters are used. With a few exceptions the motors are excited from the 250-volt buses or feeders that supply power to the cranes and direct-current motors throughout the plant. Motors located so far from the direct-current lines that a special circuit to the motor for excitation

would cost nearly as much as an exciter are equipped with direct-connected exciters.

Two types of loads are selected for synchronous motor drive: (1) Widely fluctuating loads having a low load factor such as bandmills, edgers, slashers, trimmers and hogs; (2) large loads of high-load factor such as fans, pumps and air compressors. Synchronous motors are used for driving bandmills, edgers, slashers, trimmers, resaws, hogs, pumps, air compressors and large planing mill exhauster fans. Such motors are not used on drives that require frequent starting.

Synchronous motors have proved very satisfactory for widely fluctuating loads, the application to driving hogs* being a striking example. Such machines present one of the most difficult problems to be found in a sawmill in applying synchronous motor drive. The varying nature of the refuse fed by conveyor into the hog causes the load to fluctuate over extreme limits, reaching 200 to 300 per cent of normal at times. Motors of 250 hp. at 600 and 720 r.p.m. and 400 hp. at 600 r.p.m. are used for these drives. These motors have the field control relays so adjusted that when the motor pulls out of step due to overload the field excitation is cut off, but will automatically be restored when the motor again approaches synchronous speed. This may occur as many as 100 times during an eight-hour shift.

Induction Motors—The 2,300-volt induction motors range from 50 hp. to 250 hp. and are mostly of the wound-rotor type. They drive machinery requiring frequent starting or machinery which will not permit of the severe strains imposed on it by the full-voltage across-the-line starting. Some equipment requires limited speed control and for this purpose the wound-rotor motor with drum type controller is used. Induction motors of 50 hp. and smaller ratings are wound for 550 volts. Except in sizes of 7½ hp. and smaller the 550-volt induction motors are of the so-called double wound-rotor type. These have the starting characteristics of the high-resistance rotor motor and the running characteristics of the squirrel-cage type. Full-voltage across-the-line starters are used for all motors.

Factors affecting selection of equipment

There is no specific rule governing the application of motor drive to sawmill machinery. The power required for driving the various sections can be computed using the same laws that govern the application of electric drive to any other line of machinery. Before attempting to determine the motor requirements for these applications, however, one making these computations should be thoroughly familiar with the possible loading of the various sections to be driven. In applying motor drive to live rolls and transfer chains the matter of obtaining sufficient starting torque is usually the prime consideration, because the transfer tables, in particular, are so short that if they were left in operation for a period of a minute or two they would completely unload all of the material that is on them.

Selecting the proper starting equipment requires considerable thought, for with the frequent starting and stopping of the various sections the duties imposed on the starting equipment are even more severe than those imposed on the motors. Maintenance men spend more time keeping the starting equipment in good operating condition than they do the motors themselves. There are many applications where thermo type overload relays will not function if the doors of the cabinets inclosing the starting panels are left closed. This is due to the rise in temperature within the cabinets caused by the arc created in frequently opening the circuit of the motor. Some of the transfer tables in the mill are started on an average of four to five times per minute.

Automatic control saves idle operation

One of the advantages of motor drive is the ease with which the machinery can be started and stopped. This permits shut-down of the motors when they are not actually engaged in moving lumber. This operation, in many cases, constitutes only a fraction of the total working time, as considerable wear and tear of the machinery is prevented by stopping movements when not actually needed.

For instance, a train of several sections of live rolls may be used for carrying timber to the dock. As the timber does not come with any degree of regularity the rolls need operate only a small portion of the time. A trip-pan arrangement placed between successive rolls is mechanically connected to the starting stations of the motors driving the sections in such a manner that when the pan is depressed by the timber going over it the motor is kept in operation and will stay in operation until all of the pans in that train of rolls are raised to the up position. With such an arrangement each section of rolls is started as the timber approaches the rolls and automatically stops when the timber has gone by the section.

Some perplexing problems

Adapting individual motor drive to the machinery of a lumber plant presented many perplexing problems. With few exceptions, the final sawmill and wood-working drives fall in two groups: A slow-speed group and a high-speed group. Log hauls, transfer tables and conveyors belong to the slow-speed group, with final speeds ranging from 1½ r.p.m. to 25 r.p.m. Live-roll drives ranging from 100 to 175 r.p.m. can also be placed in this class. The cutting speeds for the saw teeth and knife type cutters range from 8,000 to 14,000 ft. per minute, which calls for motor speeds ranging from 300 r.p.m. to 7,200 r.p.m. Obtaining the mechanical connections and motors with economical characteristics for these speeds did not present the difficult problems involved in the slow-speed drives.

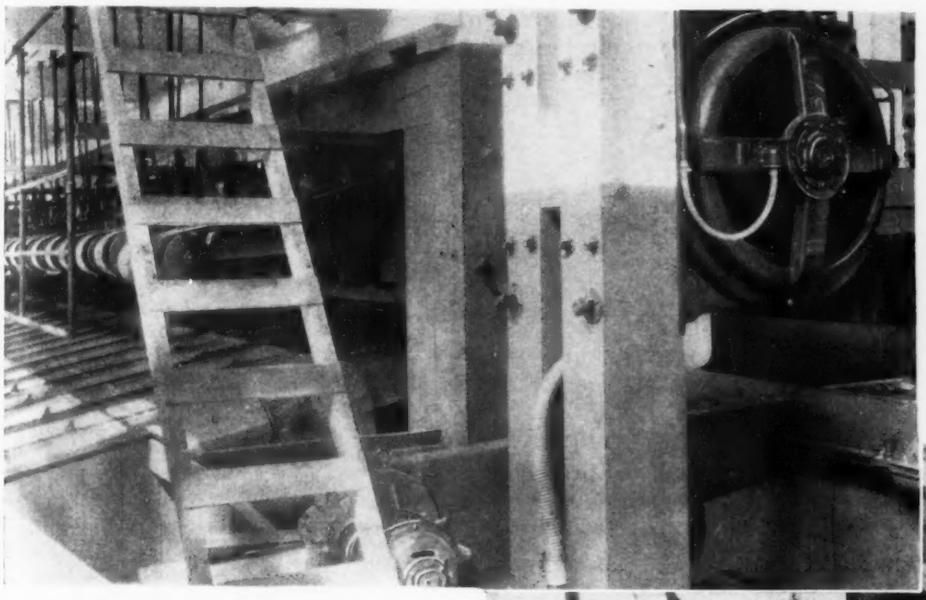
Not until the herringbone gear was developed and not until it became practical to built speed-reducing power transmissions of large reduction ratios did individual motor drive for the slow-speed groups become practicable and economical. Now reduction ratios of 150:1 may be used with high efficiency, so motors of 1,200 to 1,800 r.p.m. may be used for practically every slow-speed drive, resulting in better load characteristics and greater economy of installation. The standard ratios for gear reduction units used by the Weyerhaeuser company run in multiples of ten; i.e., 10:1, 20:1, 40:1, 60:1, 80:1, 90:1 and 120:1. These seem to fit all needs. A further refinement of speed adjustment can be made in the chain drive from the reduction unit to the driven machine.

**A "hog" is a machine for grinding up slabs and other refuse into small chips suitable for burning under the boilers.*

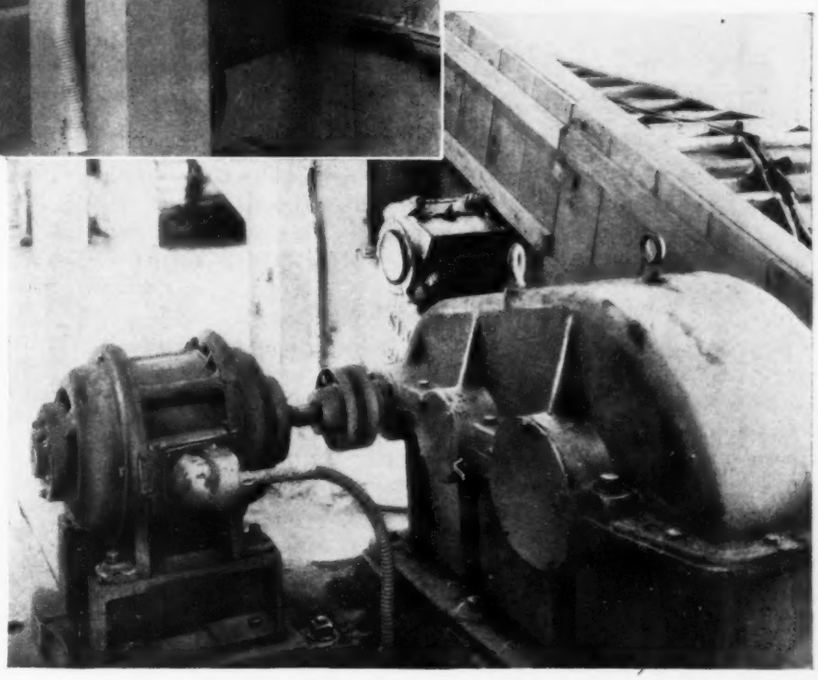
Steel roller chain (Nos. 6, 7, 8 and 10, with double 8 and double 10) are used for extra heavy drives and for these final connections.

An unusual motor application in this mill is that employed for driving the main bandsaw. For the regular run of fir logs a saw speed of 10,500 ft. per minute is the ideal speed. On the other hand, certain specie of fir, logs of exceptionally dense texture, those that have been dead so long as partially to dry out, or logs that are frozen require a saw speed of 8,000 ft. per minute. As the logs requiring the slower sawing speed are mixed promiscuously with the softer texture logs, the custom has been to saw them all with the higher speed saw, resulting in erratic sawing of the hard or frozen logs with their irregular resistance to the cut.

Arrangements were made for practically instantaneous speed changes from 10,500 ft. to 8,400 ft. per minute at the Longview mill. This was accomplished by placing two synchronous motors on one motor base, with the shafts rigidly coupled, to drive the same pulley. A 400-hp., 600-r.p.m. motor is used in starting the bandmill and for sawing the average run of logs; the other motor is a 250-hp., 480-r.p.m. unit. While the large motor is used for furnishing the power, the small motor is disconnected from the line, so the windage loss is the only power required to drive it. When a hard log is to be sawed the sawyer, by pressing two push buttons, disconnects the large motor from the line and connects the small motor. This drops the speed of the saw to 8,400 ft. per minute, the change from one speed to the other being made as frequently as the sawyer deems necessary. Another interesting application of electrical power to sawmill machinery is in driving the feed works of the larger edgers.* The edger arbor on which the saws are mounted is direct connected to a 400-hp., 80 per cent power factor, 1,200-r.p.m. synchronous motor. The rolls that feed the stock into the edger are driven by a 10-hp. series-wound motor through reduction gears and chain drive. These are so proportioned that with no load on the motor the surface speed of the rolls will pull the lumber into the edger as rapidly as good work can be done with the saws. As larger and thicker pieces are sent through the edger the load on the feed works motor increases and automatically decreases the feed so that the thicker stock is fed into the edger more slowly. The



Synchronous motors have wide applications in sawmills. Ball bearing unit driving trimmer saws



Unit reduction gears connect high-speed induction motors with conveyors and other slow-speed operations

**The edger is the machine that rips the boards and timbers into the desired widths.*

speed characteristics of the 10-hp. motor are such as automatically to provide the proper rate of feed into the saws for the varying thickness of material being sawed.

Another electrical application is the use of solenoids for remote operation of cylinder valves. By using solenoids for this purpose the valves of cylinders can be operated from several distant points.

High-speed applications

Recent developments in planing mill machinery such as matchers, molders and saws, has opened a new field for the use of high-speed, direct-connected motors. A large modern matcher has eight motors, totaling 270 hp., built into the machine. For these applications machine manufacturers buy the rotor without shaft and the stator without frame from the motor manufacturers and incorporate these in the construction of the machines. As the cutter head cylinders all turn in ball bearings and are very heavy and carefully balanced, they will continue to run for ten or fifteen minutes after the current has been cut off the motors. To make it possible to stop these quickly the control is equipped for plugging service, so that when it is necessary to stop a head or cylinder for any purpose the motor is plugged or reversed, bringing it to a stop in a few seconds.

Modern molders are built for variable speeds of the spindle. This variable speed is obtained by varying the frequency of the circuit by the use of frequency changers. For normal work the cylinders are equipped with six or eight knife cutters and usually operate at 3,450 r.p.m. For the exposed surfaces of the molding that require a finer finish the particular heads used for this purpose are speeded up by changing the frequency so that the motors operate at 6,000 r.p.m. or 7,200 r.p.m. The control equipment is so arranged that any one or all of the five cutter heads or cylinders of the molder can be speeded up.

Electricity in logging

Electric power is now being used advantageously in every branch of the lumber industry. It is being used in the woods in a limited way for driving portable saws for felling trees and bucking them into log lengths. These saws consist of chains with cutter teeth attached to one side of the links, that run over two sprocket wheels mounted at each end of a light steel frame that serves to hold the sprockets in position and form a guide for the saw chain. A specially designed motor of about 5-hp. rating, geared to the driver sprocket, furnishes the power for driving the saw. Power for the operation of these saws is taken from a near-by transmission line or from a small gas-driven generator set, which may be used for supplying power to several such saws working within a limited area.

Electric power is also being used in a limited way for yarding* and loading logs. On large operations, where load factor or period of operation per year is high and where life of operation is long enough to permit of reasonable obsolescence charges, this has proved profitable.

One serious disadvantage to the use of electrical equipment for woods operation, however, is the danger of loss of equipment by fire. While the loss by fire is insurable, as far as property damage is concerned, it would hardly be practical to carry "use and occupancy" coverage due to high cost.

The cost of electrical logging equipment is so great that units are built only on order. The time required to replace a machine or repair one damaged by fire would be so great as to result in too great a loss of production to warrant the adoption of electric power for logging operations except in a few special cases.

Electric power for the propulsion of the trains hauling the logs out of the woods is also being used in one or two instances. Insufficient tonnage on the average logging railroad will prevent its general adoption for this purpose.

This is the operation of dragging the log from where it was cut out of the tree and loading it aboard the cars for shipment to the mill.

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Safety Activities on Electrical Properties*

IV—Safety Rules

SAFETY regulations, impartially yet strictly enforced, discourage unsafe practices on the part of employees, thus serving as a supplement to other supervisory and educational safety work. Such rules are usually observed when the reasons for them are clearly explained by means of bulletin board publicity or by comments in published rule books.

In three cases safety regulations are included in the specifications of new construction undertaken by contract and safety supervisors or inspectors are assigned to enforce them if necessary.

First aid

Efficient first-aid treatment is recognized as an important adjunct to safety work, providing for emergencies pending the arrival of a physician and tending to reduce the number of infections which frequently result from the neglect of slight injuries.

Substations, trucks, street department crews and line gangs are often equipped with first-aid kits for use under the supervision of an employee who has received first-aid training. In larger units it is customary to provide a first-aid room which is well maintained and properly equipped and is in charge of a nurse or experienced employee, devoting either full or part time to the work. In addition to these provisions, many gas and electric utilities arrange for complete instruction of employees in first-aid emergency treatment, selecting representatives from each operating unit in order that prompt and intelligent attention may be available in case of emergency occurring anywhere on the property. It has been proved that instruction of this nature given to employees also serves as a means of stimulating their greater interest in safety.

The majority of the reporting companies provide one or more inhalators for emergency use. In some cases

*See ELECTRICAL WORLD *April 26, May 3 and 10.*

these are serviced by the utilities themselves, and in others by the manufacturer. In six companies selected crews are trained by specialists who give frequent lectures and demonstrations regarding the operation of this equipment. This is followed by actual practice. In organizing emergency crews, at least one trained employee from each shift is selected.

All but three companies conduct a course of instruction in resuscitation for all employees except those engaged in clerical occupations. Several companies provide first-aid instruction dealing with dressing for various injuries, the care of cuts and abrasions, the dangers of infection, the treatment of various forms of unconsciousness, the use of gas masks and inhalators and the care of first-aid equipment.

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Uhl River Project to Develop 185,000 Hp. for India

INDIA promises to soon be one of the leading countries of the world in regard to the development of hydro-electric resources. One of the most noteworthy schemes emanates from the Punjab, where the efforts of Colonel Battye, R.E., will shortly bear fruit and the power generated on the Uhl and Ranan Rivers at the foot of the Himalayas will be distributed to 60 important cities in the province.

The project is a tunnel scheme of the pressure type with a large storage and has a gross head capable of development in three stages of no less than 3,500 ft. with an ultimate yield of 185,000 hp. The watershed of the Uhl River covers 150 square miles and lies at a height varying from 6,000 to 16,000 ft. The main water supply is therefore from the melted snow, but even through winter there is a flow of 125 cu.ft. per second. Another stream, the Rana, flows parallel to the Uhl in an adjoining valley at a level of 3,000 ft. lower. The main feature of the scheme is a tunnel through the line of dividing hills so that the water from the Uhl can be taken to a power station at Shanan on the Rana. The tunnel as designed is 2¾ miles long and 9 ft. in diameter and will convey the ordinary flow of the Uhl through steel pipes down a final drop of 1,800 ft. from the tunnel mouth to the power station. By this means 36,000 hp. will be developed and provision has been made for an increase to 70,000 hp. In the second stage of construction a dam will be provided above the entrance of the tunnel to conserve the water from the summer thaw, thus another 95,000 hp. will be developed. Later the tailrace water of the upper plants will be taken through an open duct about 3 miles long down a second fall of 1,200 ft. to a power station on the Ranan, where another 65,000 hp. can be generated. The completion of the first stage of the project provides for local distribution and lighting in twenty important towns and the later stages will carry current for a further 39 towns.

The scheme was started in March, 1926, and 2¾ years were spent in the installation of the construction plant, consisting of a mountain railway, a system of three heavy haulages, temporary electric power houses to provide 1,200 kw. for construction purposes, electric traction, and the various services necessary to drive a high-pressure water tunnel. While originally expected to be completed in four years, the project, owing to various difficulties in construction, will now take 6½ years and will be ready to supply toward the end of 1932. Pending this supply Amritsar and Lyallpur have been electrified by power from the temporary steam-power stations and proposals are under way for the electrification of six other large towns pending completion of the project.

View of Uhl Valley near head of tunnel to yield 185,000 hp.

The total cost of the project will be about $20,000,000 and the annual expenditure to operate the scheme will be about $1,800,000. The total supply will be 38,250 kw. On a basis of 40 per cent load factor the cost will be about 1.4 cents per kilowatt-hour, and it is proposed to sell energy at 1.7 cents per kilowatt-hour, a rate unprecedented in the electrical supply industry in India.

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Detroit Edison Uses Airplane Patrol

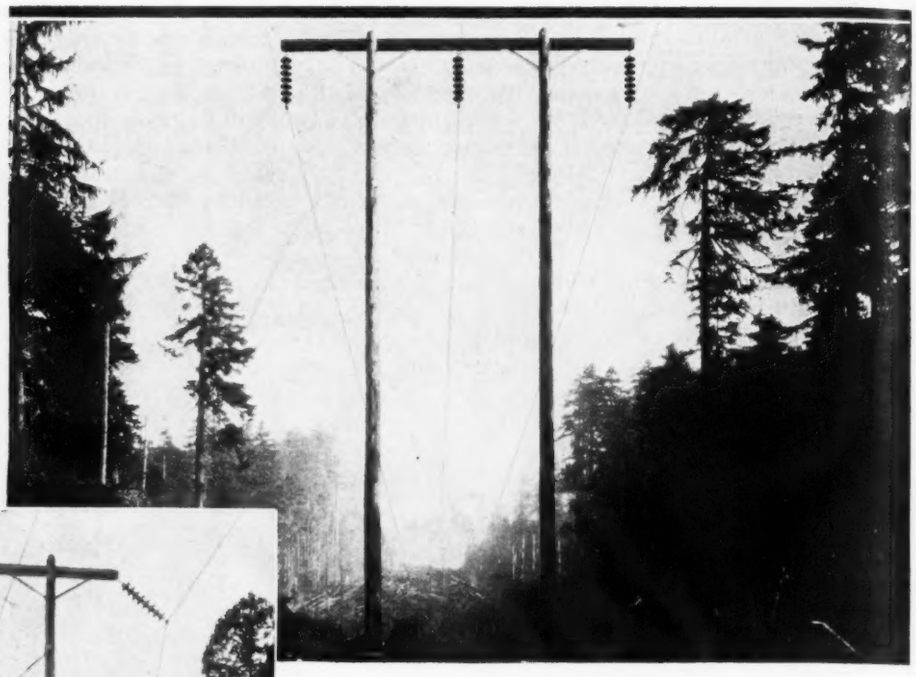
THE Detroit Edison Company has been experimenting with the airplane for patrolling its 120,000-volt power lines. As a great many of these lines cut across country, they have in the past been patrolled on foot.

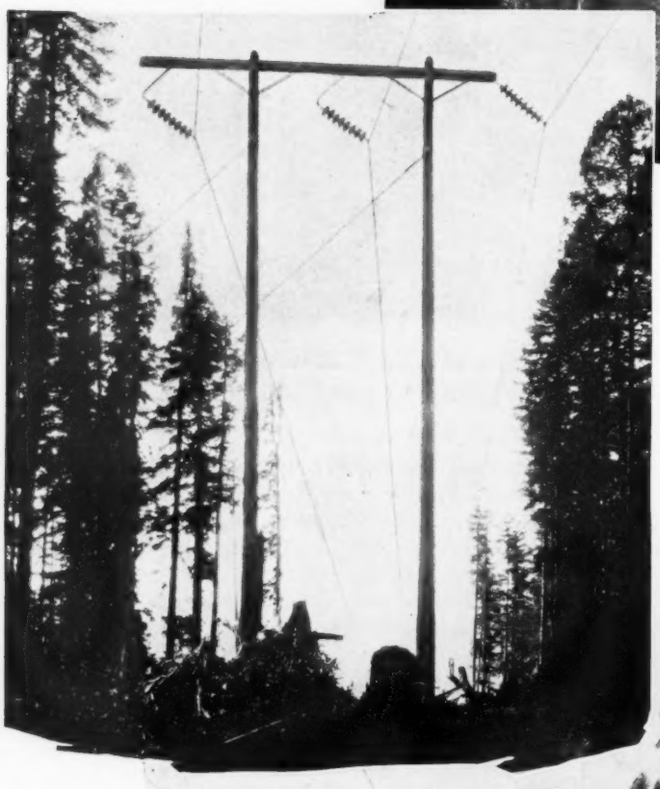
The company has been using a Curtiss two-seater cabin monoplane; one observer watches for defective insulators, ground wire, etc., the other inspects the conductors. The plane is flown within 60 or 75 ft. of the power line, just above it and slightly to one side. On emergency patrols it has been the practice to fly over each line twice, first on one side, returning on the other.

Arrangements have been made with the Curtiss Flying Service and Grosse Ile to meet the company's observers at Ford Airport within 30 minutes from the time they receive a call.

Dense Forest No Barrier to Transmission Line

Many are the difficulties of transmission line construction on the Pacific Coast. These three views, taken along the 63-mile, 110-kv. line between Dixonville and North Bend, Ore., show character of a large part of the right-of-way and types of construction employed.





Too Many Specifications— Too Inadequate Drawings

By M. M. SAMUELS

J. G. White Engineering Corporation

A GREAT deal of truth is embodied in this exposition of why electrical wiring installations are frequently inadequate, why results are not obtained that are expected, why the ultimate cost is beyond the estimated price, etc. But the author is not merely critical in his attitude. He suggests a solution of the problems.

WHILE other engineers, and particularly contractors, may not agree with all the author says, the comments open up a subject that needs discussing if the problems are to be widely eliminated. Viewpoints of other people are welcome.

TOO much emphasis is placed on specifications and too little emphasis on drawings. Enormous power houses are being built daily without any so-called electrical specifications whatever, except such specifications as are needed for the purchase of important equipment. The drawings, possibly superimposed by bills of material, contain all the instructions required for the enormous amount of conduit, cable and accessories of a large power house.

But when a few minor circuits are required for lighting up a store or a small garage or a small apartment house a rather voluminous specification is prepared, but no adequate drawings. The results are twofold:

First—With the prevailing labor prices, a contractor cannot afford to allow the electricians on the job to spend a great part of their time pondering over plans which tell them very little or studying specifications which tell them still less. The result is that he is forced to engage a draftsman, whose salary is much lower than that of an electrician, to prepare plans of his own. Thus the contractor is forced to presume the position of an electrical engineer without having the necessary qualifications for it, even though his draftsman may put P.E. behind his name, indicating that the state license is the only thing that establishes him as an engineer.

Second—Words are more subject to misinterpretations than details on drawings, and the voluminous specifications and inadequate drawings are the results of all extras and litigations. The unscrupulous contractor thrives on extras, he quotes a price below his own cost, expecting and often succeeding to make up on extras.

If specifications were shorter and drawings more adequate, the unscrupulous contractor would disappear from the scene altogether.

Specifications for each job superfluous when code will satisfy

The following incident may help illustrate the first point: An engineer was engaged on the design of a large power house for a client who happened to be engaged at that time on the building of a number of country homes, club buildings, etc. That particular client had on his staff an architect who was quite competent, but apparently had never seen or heard of a power house. One day he called the engineer on the phone advising that he was working on a specification covering the power house lighting and proceeded to read it over the telephone. After reading for about three-quarters of an hour, he asked for the engineer's opinion, which was to the effect that it was very good indeed, but that the engineer could not see the need for it at all, because what the architect had read was merely about half of the Electrical Code, and not the Code in force at the time, but of an obsolete one. He had evidently copied it from an architect's handbook or textbook.

Then the architect suggested that the engineer prepare the lighting specifications, to which the latter replied that a power house lighting job is principally a conduit job, and that the drawings were complete and required no further specifications, and, furthermore, that the installation was already completed and the lights turned on without benefit of specifications. After looking over the drawings the architect thanked the engineer for saving him a great deal of trouble, adding that he realized that he had attempted to do this particular detail from a

handbook, while he was not at all in the habit of doing his architecture from a handbook.

The second point will best be illustrated by the fact that two different contractors told this author at two different times that they refuse to quote on specifications and plans prepared by Mr. D. because there is no opportunity for extras, his specifications being very short and his drawings very explicit. Every experienced man could recount quite a number of such instances from his own experience with contractors who were sadly disappointed for the lack of any extras.

Higher costs result from incomplete construction drawings

How are electrical drawings for buildings being prepared and how should they be prepared? It is much easier to say how a thing should be done than it is to say how it should not be done. But a few of the outstanding follies may be mentioned:

1. The custom of architects merely to indicate outlets on their plans, without showing any conduit runs or specifying wire sizes, causes most of the confusion. A contractor must bid a lump sum price on this work against competition, and he will naturally try to find the cheapest way of doing the job, regardless of the quality of the work done.

2. Sometimes one comes across plans which attempt to indicate conduits, but do not follow it out. A conduit is shown starting somewhere, terminating in an arrow pointing to something, and it is necessary to search through a stack of blueprints to find the place to which it is pointing.

3. The conduits for a ceiling are shown, indicating only those which supply the fixtures in that particular ceiling. Those that go in the same floor slab, but which control circuits elsewhere, are shown elsewhere. Try and find them. Those that are not located in this slab, but which control circuits on this ceiling, are shown on the same plan. This is a very amateurish practice.

4. Such important equipment as main switchboards, motor control equipment, etc., is neither shown nor specified in detail. Any old junk that the contractor may furnish which works at all will do. Here too, unless equipment is specified in detail, the contractor will take advantage of the fact that electric energy will somehow find its way through any closed circuit.

5. Number and sizes of mains are very seldom given, and here too the contractor quoting against competition must figure on a minimum. This is probably the principal cause of inadequate wiring.

6. Local switches are often left out on the drawings, resulting in the numerous pull chains so frequently encountered in modern offices.

These are only a few of the crimes committed in the name of engineering. It would be helpful if readers would report others so that they can be accumulated and made ready for the benefit of the trade.

How should drawings and specifications be prepared? Since the more complicated power houses get along without voluminous specifications, because for them competent drawings are generally prepared, it would be advisable in the design and specifications of electrical equipment and wiring for building construction to follow the same methods employed on power houses. It should not be necessary to say much about it.

However, a few points may be brought out, which should serve as a guide for those who prepare such plans and specifications:

1. All major equipment, such as main switchboards, distribution switchboards, transformers, etc., should be designed and specified in detail independent of the wiring layout. It should not be made a part of the electrical contract, but should be purchased by the owners separately, and the contractor should only be required to install them. In cases where labor conditions call for wiring switchboards on the job, the electrical contract should stipulate that the contractor wire the switchboard in accordance with drawings and instructions furnished by the switchboard manufacturer, and possibly under the supervision of the switchboard manufacturer's representative.

2. Any important part of the wiring system, such as transformer houses, main connections at switchboards, etc., should be designed in detail on separate drawings, and all parts specified in detail.

3. The stipulation of a definite sum in the electrical contract for lighting fixtures is a nuisance, the causes for which had better be left out of the discussion. The fixtures should be purchased separately by the owners, and the contractor should only be called upon to install them.

4. The locations and types of lighting equipment shall be determined by the illuminating engineer, who should quit right there.

5. The conduit system, wiring and secondary switching system should then be undertaken by the electrical engineering profession. Conduit plans should be prepared in the same manner in which they are prepared for power houses, each conduit run being shown completely, the sizes of conduit and cable being indicated directly on the plans, or where this becomes too complicated each conduit being identified by a number and the sizes of conduits and cables being given in a separate tabulation. The standard contractors' symbols for identifying equipment and numbers of wires in conduits only lead to confusion. It is never found necessary to resort to them on the more complicated power installations, so why should they be necessary on the much simpler building installations? The little dashes across a conduit, the number of which are intended to indicate the number of wires therein, only make the conduit look like a railroad track and complicate the drawing. The number 6 is much easier to write and to read than six dashes. Drawings are intended for people who are literate and can read the alphabet and Arabian numbers, and there is really no need of Egyptian hieroglyphics.

6. For larger installations the main conduit system should be shown separate from the conduit layout for branch circuits.

7. A gang of electricians working on the forms for a floor should have a drawing showing all the conduits going in this particular slab, regardless of what the conduits are intended for or whether they are continued up or down. He should not have to look for one conduit on a drawing, another on another drawing and a third on a third drawing. This drawing should not show any conduits that do not go in this slab. They should be shown on another drawing, paper and tracing cloth being quite cheap, and it costs very little more to draw a line on one drawing than to draw it on another drawing.

8. No plans are ever complete. Cross-sections and elevations are absolutely necessary to explain them.

If the preceding suggestions are followed out there will be very little need for voluminous and platitudinous specifications, provision being necessary only for the usual capital obligations, guarantee and interference clauses. Furthermore, the majority of extras, litigations, misinterpretations and hard feelings would be done away with, and the unscrupulous contractor would disappear altogether.

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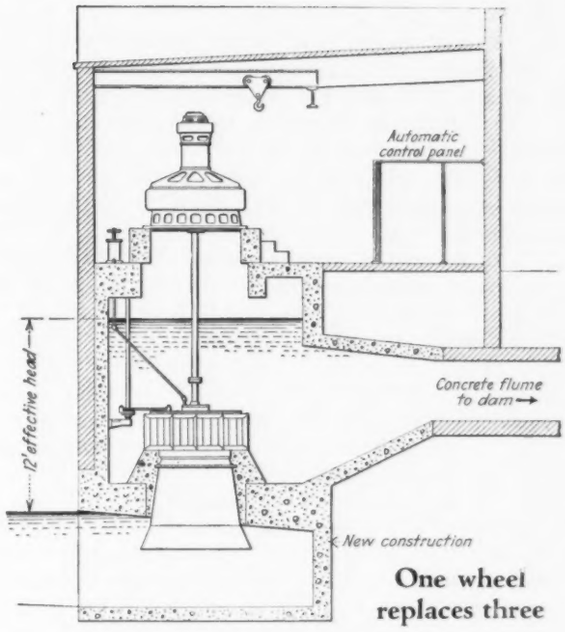
Rebuilt Hydro Plant Saves Money and Water

By MERL W. PARR
Iowa Public Service Company, Waterloo, Iowa

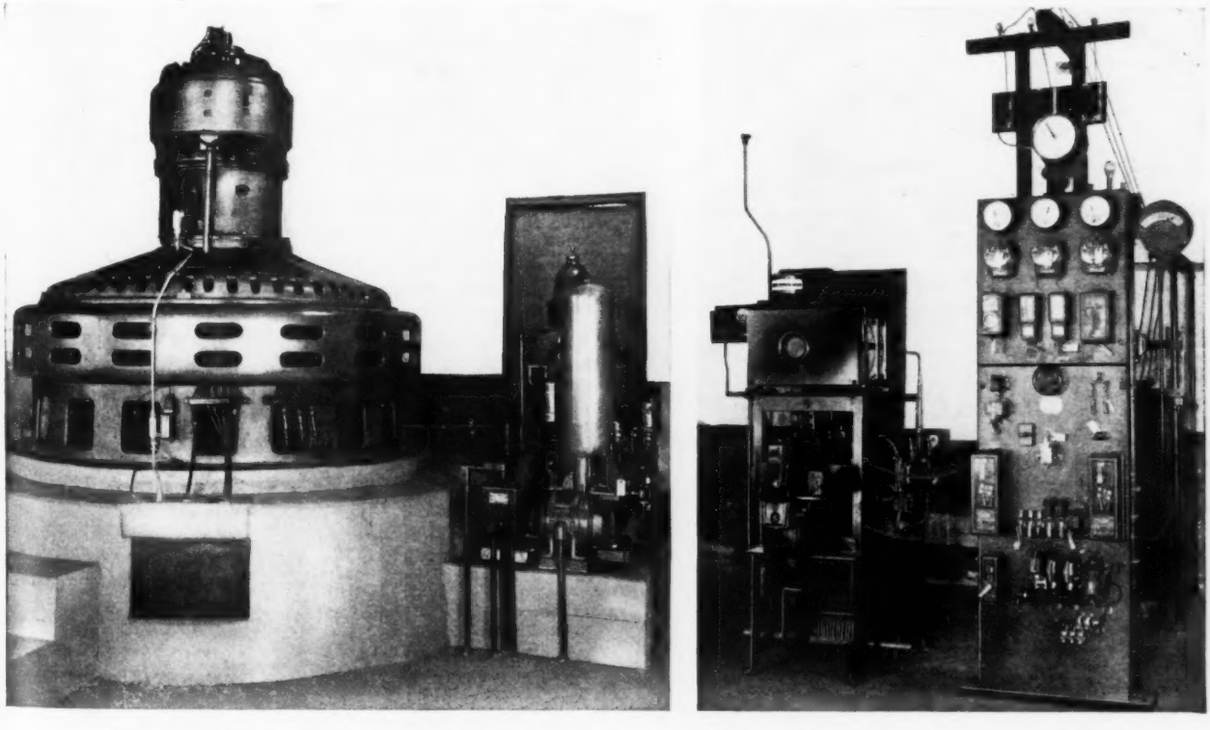
EXPENDITURE of $24,000 turned the 90-kw. Charles City hydro plant of the Iowa Public Service Company into one of 150 kw., reduced operating costs $2,800 per year and increased the average annual energy output from 650,000 kw.-hr. to nearly a million. Also the plant is now a dependable unit in the system, capable of responding to demands far in excess of its former ability.

Previous to the change the plant contained three 35-in. Sampson wheels rated at 100 hp. in wheel pits about 8 ft. square. These wheels were connected to a horizontal shaft by cast-iron core gears with wooden teeth and one 50-kw. and one 100-kw. generator connected to the horizontal shaft by means of rope drives. When the plant was put in operation it was found that the flume would not furnish water enough to run all three wheels and that the maximum which could be generated with two wheels was 90 kw.



One wheel replaces three

The plant was operated until 1928, but was anything but satisfactory. Operating costs were steadily increasing and the obsolescent condition rendered operation hazardous. The area of the pond above the dam was very small, making storage of water for over-peak generation impossible. In addition to that, a plant belonging to another utility company and located up-stream had sufficient pondage to control the flow of the river, making it necessary to have an operator in continuous



Increased output and lowered costs are the results of this hydro plant reconstruction

attendance in order to take advantage of the flow of water whenever it was released by the up-stream plant.

It was decided to install the largest wheel which could be operated on the water delivered by the flume and to make the installation automatic to eliminate the operator's salary. The installation selected consisted of a 36-in. vertical shaft turbine for mounting in an open penstock on a steel plate draft tube to operate under a 12-ft. effective head at 200 r.p.m. and direct connected to a 150-kw. vertical type alternator. The alternator was purchased equipped with self-lubricating guide and thrust bearings, an oil-pressure-operated brake and the necessary speed and bearing thermal relays. The governor is of the oil-pressure, direct-connected type, with the governor head arranged for electric motor drive. The installation required the construction of a new wheel pit 16 ft. square and widening out the ends of the flume to meet the new wheel pit walls.

Under normal operation the outgoing lines from the hydro plant are energized from the steam-generating station, located in Charles City, thus making alternating-current energy available on the alternating-current control bus at all times. The operation of the plant is controlled by a float switch. In the case of loss of load, d.c. overvoltage, overheated generator windings, overspeed, underspeed, low governor oil pressure, or overheated bearings, the unit is automatically shut down. In the cases when the a.c. overcurrent relays act, or of field failure, the machine shuts down and is locked out, making it necessary for an attendant to visit the plant before it can be again put into operation.

The plant has now been in operation for nearly a year. An engineer visits the plant once daily to make routine inspection. As the output from the hydro plant is metered at the steam plant, the operator there can readily detect when the unit has shut down or locked itself out. Comparison of the operating results for eight months' operation as an automatic station with the average annual operation with the old plant is gratifying. The average annual generation of the old equipment was 650,000 kw.-hr. and the annual operating costs were nearly $4,000. Although this year has been a dry year, the output of the automatic unit to date has been 642,000 kw.-hr. and the average operating cost has been about $100 per month.

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Electric and Fuel Costs for Four Heat-Treating Installations

By WIRT S. SCOTT
Special Representative
Westinghouse Electric & Manufacturing Company, Mansfield, Ohio

A COMPLETE survey of heating costs of a number of heat-treating operations have been attempted for the purpose of adding to the information on this subject. In every case it was found that the cost of fuel or electricity was but a minor part of the total cost of the heat-treated product, also that savings effected through the reduction in rejects, labor and other operating expenses in comparing two different types of equipments have a far greater value than the cost of fuel or electricity.

COMPARATIVE HEAT-TREATING COSTS

Hardening and Tempering Axes

Warren Axe & Tool Company

Open hearth type gas furnaces:	
Natural gas, per 1,000 cu.ft.	$0.43
Cost per month	$150.00
Bath type electric furnaces:	
Electricity, per kw.-hr.	$0.02
Cost per month	$276.00
Increased cost of electricity, per cent	84

Electricity at 2 cents per kilowatt-hour would equal natural gas at 79 cents per 1,000 cu.ft. for this installation. The saving per year in labor, inspection, testing and field rejects, using electric heat for one year, is sufficient to pay the electric bill for *four years*.

Hardening and Tempering Automobile Axles

Salisbury Axle Company

Semi-muffled oil furnaces, hearth type:	
Oil per gallon in tank car lots	$0.06
Handling charge allowed per gallon	0.014
Oil cost per 100 lb. of product heat treated	0.2645
Pusher type electric furnaces:	
Electricity, per kw.-hr	$0.0117
Electricity cost per 100 lb. of product heat treated	0.2120
Increased cost of oil over electricity, per cent	24.7

Electricity at 2 cents per kilowatt-hour equals oil at 7.8 cents per gallon. The total savings, using electric heat, in labor, breakage of tools, etc., was sufficient to pay for the complete installation in one year.

Hardening and Tempering Shovels

Baldwin Tool Company

Bath type gas furnaces:	
Natural gas, per 1,000 cu.ft.	$0.325
Cost of gas for the production of 52,000 shovels	$100.00
Cost of supplying air for gas furnaces	14.23
Total gas cost	$114.23
Bath type electric furnace:	
Electricity, per kw.-hr.	$0.0125
Cost of electricity for the production of 52,000 shovels	$248.00
Increased cost of electricity over gas, per cent	117.5

Electricity at 1¼ cents per kilowatt-hour equals natural gas at 84.7 cents per 1,000 cu.ft. That the cost of fuel is a small part of the expense may be shown by the statement that the actual book value saving, using electric heat, is 22.5 times the cost of natural gas.

Hardening Ball Bearing Races

Marlin Rockwell Company

Salt bath type oil furnaces:	
Fuel oil per gallon delivered	$0.0575
Cost of fuel per 100 lb. of product heat treated	0.41
Rotary type electric furnace:	
Electricity, per kw.-hr.	0.0125
Cost of electricity per 100 lb. of product heat treated	0.37
Increased cost of fuel oil over electricity, per cent	8.0

Electricity at 2 cents per kilowatt-hour would equal fuel oil at 8.22 cents per gallon. Electric heating showed a net annual saving of $30,000 over fuel furnaces.

Hearth type oil furnaces:	
Fuel oil per gallon delivered	$0.0575
Handling charges per gallon	0.0135
Cost of fuel per 100 lb. of product heat treated	$0.24
Rotary type electric furnace:	
Electricity, per kw.-hr.	$0.0125
Cost of electricity per 100 lb. of product heat treated	$0.37
Increased cost of electricity over fuel oil, per cent	54

Electricity at 1.25 cents per kilowatt-hour would equal oil at 8.85 cents per gallon delivered. Electric heating is showing a net saving of $9,237 a year over fuel furnaces.

It is of interest to know the relative values of the heating costs. The types of furnaces considered will affect the fuel or power bills, and it is not always possible to obtain a direct comparison of similar types of equipment. However, the more information made available of comparative costs the better will the user be able to give proper consideration to the kind of heat source to use in connection with his heat-treating process.

The data given in the accompanying tables consists of heating costs reduced to unit values and were computed from authentic records obtained from the users of this equipment.

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READERS' FORUM

A Consultant's Viewpoint

To the Editor of the ELECTRICAL WORLD:

As a consulting engineer, I have read with great interest the various articles in the ELECTRICAL WORLD relative to the design of lighting and wiring of buildings. I would appreciate an opportunity to state a few words from the standpoint of the engineer who makes a living from this type of work in purely a consulting capacity.

It is recognized that the promotion of the art of illumination depends almost entirely upon the sales force and educational facilities of the manufacturers and utilities. The amazing growth of the electrical industry is due largely to the efforts of these corporations.

On the other hand, many of the higher class electrical contractors, and others, have recently expressed the opinion that better electrical installations are produced when complete plans and specifications are used as a bidding basis. These plans must, almost necessarily, be drawn by a consulting engineer. This engineer must be thoroughly familiar with all the phases of illumination, building wiring from a practical and theoretical standpoint, and all electrical equipment which makes up a part, or is likely to be installed, in a building. Consulting engineering services are a definite asset to the industry.

Utility illumination engineers contend, and rightly so, that they do not attempt to compete with consulting engineers on jobs where consultants are retained. What most of them fail to understand is that they are providing a free service which takes away a large portion of the work upon which the engineer is dependent for his existence. Small building jobs which are usually laid out by utility men and salesmen would, if available to a consultant, often mean the difference between a losing business and one that pays a decent return. Many of the best engineers are lured away from this field because other employments offer better remuneration. The only way to encourage good engineers to work in the consulting field is by providing them with enough profitable work to make their business pay.

Illumination sales engineers could well afford to give consultants a boost when talking to a prospective purchaser of electrical equipment. Not that these men should recommend any one engineer, but they could mention the names of three or four of the best in the district. Not only co-operation, but actual recommendations from the utilities and manufacturers, instead of competition, would work wonders in placing consulting engineering on a higher plane. It would be of benefit, indirectly, to the entire electrical industry.

G. B. MOORE,
Chief Electrical Engineer.

G. M. Orr & Company,
Minneapolis, Minn.

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Seeks Objection to Bare Neutral Wiring

To the Editor of the ELECTRICAL WORLD:

When a line is grounded at its terminus why should it carry insulation throughout the remainder of its length? Doesn't it look ridiculous to hook one end of a neutral wire on a water pipe and then insist that a 600-volt test be applied to the insulation of the neutral wire? Would it not be far better and much safer to run all neutral wires bare rather than insulated? First of all, it will reduce the cost of installation. It will eliminate the possibility of wrong polarization. It will greatly reduce the fire hazard present in the insulation on neutral wires now common to commercial installations.

Instead of wasting insulation on the ground wire, why not put possibly a little more rubber of a slightly better quality on the "hot" wires and instead of a single protecting braid use two or three good braids, which will serve to protect the rubber from fracture. I have found that the white braid used on most neutrals is impregnated with what apparently is some form of paraffin and is much more easily burned than the tar-product insulation on the black wire.

Naturally the wire manufacturers are not going along with me heart and soul when such a wiring system means a decreased revenue for them, but if their intentions are good and their hearts are set on the betterment of the industry, I see no objection to this system of wiring.

In the plant where I serve as electrical engineer we are coming more and more to use a complete grounding system, not only on lighting and portable-tool equipment, but on power equipment, and I can assure you that we don't use white wire with paraffin insulation on it for a ground wire. If a bare ground system is safe in an industrial plant, with its much more complex voltage system, why, then, should it not work equally as well for commercial wiring systems?

It is not my intention to offer any suggestion as to how this ground wire be incorporated. It could be a bare wire. It could be used as a sheath for the "hot" wires. It could be in a number of forms. But that is a question for the merchandising section to work out to the best advantage.

This theory may be all wrong, but I don't feel that it is, for, after all, those things which are most simple of operation are usually the most effective in the end.

I might add that I am not connected in any way with any concern which manufactures wiring devices, nor am I even interested in their manufacture. My interest is wholly that of a member of the electrical industry.

If in starting the ball rolling I can in some small measure better the field in which I endeavor to serve daily, I will feel that I have done some good, which, after all, is our ultimate in this short span on earth.

W. B. FERGUSON,
Electrical Engineer.

Wilmerding, Pa.

BOOK REVIEWS

High-Voltage Cables

By L. Emanueli. New York: John Wiley & Sons, Inc. 107 pages, illustrated. Price, $2.50.

The name of Luigi Emanueli is in the forefront of cable engineers and manufacturers and is especially appropriate on a book that discusses high-voltage cables. He has contributed greatly to the art. The book treats admirably of the thermal, capillary and pressure factors in high-voltage cables. It does not delve deeply into abstruse dielectric theories and restricts itself to the mechanics of cable manufacture very largely.

A general discussion is followed by treatment of impregnating compounds and the electrostatic field and final chapters discuss the dielectric of a cable and the mechanical and electrical properties of modern cables. The book should be very useful to all engineers dealing with cables.

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Public Utility Control in Massachusetts

By Irston R. Barnes. New Haven: Yale University Press. 215 pages, annotated, bibliography. Price, $3.

There is a widespread opinion that Massachusetts in its utility regulation policy is committed to the prudent investment theory. The volume analyzes the origin of the present legislative and commission practice in that state, the extent of its departure from rigid conformity with the pure theory, the practical exigencies which made the departures necessary, the firm adherence to par values as prime index of the rate base, and the prohibition against stock dividends or capitalization of surplus. The author doubts whether there is much correlation between the Massachusetts practice and the prudent investment theory, but makes much of the certainty that the commission has cost and capital records which place the state in the unique position of adopting intelligently any theory of rate regulation which circumstances dictate.

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Wechselstrom-Leistungsmessungen

By Werner Skirl. Berlin: Julius Springer. 278 pages, 247 illustrations.

The author is meter specialist of the Siemens & Halske Company. The book was first published in 1920; this, the third, edition is stated to constitute a thorough revision of the original, particularly as to the discussion of errors of instrument transformers and their correction and the measurement of active and reactive components in polyphase circuits. The principles and technique of alternating-current measurements are so well established that novelty of treatment is scarcely to be expected; indeed, it would probably in an elementary treatise be of questionable value.

In the present volume, aside from clarity and simplicity of statement, with very little recourse to mathematical methods, a distinguishing feature is the abundance, the adequacy of size and the boldness of the illustrations, a large portion of them being circuit diagrams relating either to meters or methods of connecting them.

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Vorschriftenbuch des Verbandes Deutscher Elektrotechniker

Berlin W57, Potsdamerstr. 68: VDE Verlag. Seventeenth edition, 1,153 pages. Price, 18 reichsmarks.

The new edition, a volume of substantial size, is stated to contain all the specifications, rules and standards applying to the German electrical industry as of January 1, 1930. Its importance may be gained from the circumstance that the authorities having jurisdiction are guided by the VDE specifications. It would therefore appear to correspond, among other things, to the "Code" in the United States. Compared with the preceding, the sixteenth edition, 27 specifications are either new or have been completely revised; sixteen have been eliminated. Particular attention is called to changes affecting installation and operating standards. The procedure for securing the VDE approval of products is outlined.

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Industrial Electricity and Wiring

By J. A. Moyer and J. F. Wostrel. New York: McGraw-Hill Book Company. 469 pages. Price, $2.75.

This book is for the electrical engineer in industrial establishments who must know and apply fundamentals of wiring and machinery and for students in colleges and trade schools interested in this aspect of engineering. Wiring methods and equipment for new and old buildings, wiring and illumination for industrial plants, theaters and other special applications, characteristics of industrial motors and wiring and installation rules and regulations are discussed. Valuable material on estimating for wiring installations is included. Outdoor wiring, grounding and circuit control apparatus are other important chapters. The book treats of a frequently neglected aspect of the art and is well written and illustrated.

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The Radio Manual

By George E. Sterling. New York: D. Van Nostrand Company, Inc. 785 pages. Price, $6.

This is the second edition of a work that had four printings in its first. Its value is thus evidently fixed. The book is designed "to serve as a guide and textbook for those who expect to enter the radio profession as engineers, servicemen, inspectors, or as operators of commercial, broadcast or amateur stations." To the reviewer, going through the book to estimate its value, it certainly appears that those classified in the foregoing quotation from the preface will find the text profitable of close study. To radio professionals, full-fledged or incipient, the subjects treated combine to make the book a worthy reference work. In this connection the chapters on radio laws and traffic handling and the four appendices on naval schedules, short-wave schedules, conversion tables and maritime radio should be especially valuable.

Men of the Industry

H. C. Couch New President of Southwestern Division

HARVEY C. COUCH, president of the Arkansas Power & Light Company, was elected president of the Southwestern Division of the National Electric Light Association at the convention held last week in Hot Springs, Ark. In the South Mr. Couch is known as the "Empire Builder" for the part he played in the electrical development of Louisiana, Arkansas and Mississippi. At the present time, in addition to being chief executive of the Arkansas Power & Light Company, he is president of

the Louisiana Power & Light Company, the Mississippi Power & Light Company and the Louisiana & Arkansas Railroad. His activity has not been confined to the public utility industry, for he is also vice-president of the Bankers' Trust Company, Little Rock; director of the National Park Bank, New York; Simmons National, Pine Bluff, Ark., and other banks; chairman of the board of Henderson-Brown College, Arkadelphia, Ark.; trustee of Peabody College for Teachers, Nashville, not to mention other interests which he has cultivated.

Mr. Couch began his development work some thirty years ago in the field of telephony, when, realizing the need of the rural communities for a telephone system, he, with hardly any capital, undertook to supply the service and with associates built a system serving sections of Louisiana, Texas, Arkansas and Oklahoma, which was later taken over by the Southwestern Bell organization. Having disposed of his holdings in the telephone system, he directed his attention to electric power development and he built up from small beginnings what is now the interconnected systems of the Arkansas, Louisiana and Mississippi power and light companies.

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Roy Page Named Vice-President of Nebraska Utility

ROY PAGE, who was recently appointed general manager of the Nebraska Power Company, has just been elected vice-president of that company, assuming the title of vice-president and general manager. A biographical sketch of Mr. Page was published in the February 22 issue of the ELECTRICAL WORLD.

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HARRY E. DUNHAM, patent attorney with the General Electric Company since 1912, has been appointed assistant manager of the patent department.

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COL. WILLIAM KELLY, vice-president of the Buffalo, Niagara & Eastern Power Corporation, has been elected president of the Buffalo section of the American Society of Civil Engineers.

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F. P. CUMMINGS, a vice-president of the Commonwealth & Southern Corporation, New York, was elected a director of the Alabama Power Company, according to an announcement made by Thomas W. Martin, president, following the annual meeting of the board of directors on April 22.

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E. B. SMITH, assistant general manager of sales of the Monongahela West Penn Public Service Company, has been appointed to the position of manager of the industrial development department. In the course of his career he has worked successively for the Baltimore & Ohio Railroad, the Consolidation Coal Company and the West Penn System. With the West Penn organization he was purchasing agent in 1917, subsequently holding the positions of manager of the investment department, new-business manager, assistant treasurer and assistant general manager of sales.

K. R. MacKinnon Heads Middle West Division

K. R. MACKINNON, assistant general manager of the Nebraska Power Company and vice-president of the Citizens Power & Light Company of Council Bluffs, Iowa, was recently elected president of the Middle West Division of the National Electric Light Association at the convention in Des Moines. Mr. MacKinnon has taken an active interest in the affairs of the electrical industry throughout the Middle West. He is a past-president of the Nebraska Section of the National Electric Light Associa-

tion, and was chairman of the accident prevention committee of the Engineering National Section 1926-27 and 1927-28. He is now serving as chairman of the rubber gloves committee, a sub-committee of the accident prevention committee.

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EDWARDS R. FISH, who has been prominently identified with the power engineering field, has entered the engineering department of the Hartford Steam Boiler Inspection & Insurance Company as chief engineer of the boiler division. For some time Mr. Fish has been consultant to the boiler engineering department of the Combustion Engineering Corporation and formerly was vice-president of the Heine Boiler Company, which has since merged with

the Combustion Engineering organization. Earlier in his career he had been associated with the power plant department of the General Electric Company. Mr. Fish has engaged actively in committee work for the A.S.M.E.

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WALTER BELDING, distribution engineer of the Central Vermont Public Service Corporation, Rutland, has been elected president of the Vermont State Society of Engineers.

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J. W. HICKS has been appointed publicity director of the Byllesby Engineering & Management Corporation and Standard Gas & Electric Company, also remaining in charge of the publications of these companies issued for executives, employees, etc.

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E. R. NORRIS has been appointed assistant to vice-president, according to an announcement issued by J. S. Tritle, vice-president in charge of manufacturing of the Westinghouse Electric & Manufacturing Company. Mr. Norris, formerly general works manager, will now be responsible for all plant facilities of the company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse company since 1892.

•

T. W. NORCROSS, chief engineer of the U. S. Forest Service, is leaving in the near future for Europe to study water-power development in a number of countries where problems are presented similar to those encountered in the development of water resources in our national forests. Mr. Norcross also will attend the meetings of the International Electrotechnical Commission which will meet in Stockholm.

•

GEORGE H. WISTING, for several years manager of the industries department of the Portland (Ore.) Chamber of Commerce, has resigned to become industrial engineer with the Northwestern Electric Company, Portland. In his new position Mr. Wisting will devote his efforts to increasing the power load of the company through contact with existing power customers and securing new industries.

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HENRY S. NEWTON, for the past five years manager of the industrial development department of the Monongahela West Penn Public Service Company, has resigned. Mr. Newton is planning to retire from active business life. He has been engaged in utility work for the last 25 years, since his graduation from the Ohio State University's college of electrical engineering. At that time he entered the employ of the General Electric Company, soon becoming superintendent of one of its plants. Later he worked in managerial capacities for various utility companies, including the Hartford & Springfield Railway Company, Syracuse Rapid Transit Company, Ohio Valley Electric Railway Company and others. He spent seven years with the Monongahela System as manager of its electric railway and power properties in Parkersburg, W. Va., and Marietta, Ohio, before removing to Fairmont as manager of the industrial development department.

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Perry W. Turner Assumes New Executive Duties

PERRY W. TURNER has been elected as executive vice-president, a director and a member of the executive committee of the Alabama Power Company, according to an announcement made by

Thomas W. Martin, president. Mr. Turner was born in Cherokee, Ala., and was graduated from Washington and Lee University and from the law school of the University of Alabama. He started law practice in 1908 in Birmingham and in January, 1915, he was appointed judge of the police court of Birmingham. Later in the same year he was appointed Assistant Attorney-General of Alabama, in which capacity he conducted some noted cases in the state's history.

Mr. Turner joined the Alabama Power Company's legal department in 1918 and served until 1922, when he joined in the formation of the company's law firm of Martin, Thompson, Foster & Turner, with which he has been connected since except for the year 1927, when he served as assistant to the president of the company.

OBITUARY

FRED T. JONES, general manager of the Johns-Manville Corporation in Cleveland, Ohio, died May 8, in that city, after a short illness. A graduate of Ohio Wesleyan University, Mr. Jones was a banker in Delaware and Columbus, Ohio, for a time and then became treasurer of the Johns-Manville branch in Cleveland. Subsequently he was appointed general manager. Mr. Jones was 61 years of age.

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PEDER HEINSVIK, engineer in the construction engineering department of the General Electric Company, Schenectady, died May 1 while being taken in an ambulance to the works hospital following a heart attack. Mr. Heinsvik was born 46 years ago in Boroen, Norway, and received his technical training at the Lobnitz Engineering School and at the Paisley Technical School. He entered the employ of the General Electric Company in 1910.

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CARL P. SEYLER, president of the Seyler Manufacturing Company, manufacturer of pole line hardware and construction specialties in Pittsburgh, died at his home in that city May 2. Mr. Seyler had resided in Pittsburgh since 1900, when he was employed by Hubbard & Company to organize a pole line hardware department. As a pioneer in this field, Mr. Seyler became an outstanding figure in the electrical industry. In 1921 he resigned as vice-president and general manager of Hubbard & Company and founded his own organization, in which undertaking he was actively engaged until the time of his illness. Mr. Seyler was born in Cleveland 64 years ago.

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W. A. CARLISLE, 68, industrial agent and head of the new industries division of the Georgia Power Company, died at his home in Gainesville, Ga., May 7, after an illness of several months. Born in Newton Falls, Ohio, Mr. Carlisle was educated in Ohio and was graduated from Mount Vernon College, Ohio. Under his supervision the original power plant of the North Georgia Power Company was built on the Chattahoochee River near Gainesville. Mr. Carlisle served as president of the Gainesville Electric Company, successor to the North Georgia Power Company, for many years. Upon the consolidation of this company with the predecessors of the Georgia Power Company Mr. Carlisle joined the staff of the consolidated company and served in the industrial division from then until the time of his death.

Financial and Statistical News

WHILE most of the utility groups still apparently regard the market as more receptive to bond than to stock issues, several companies are promoting customer sales extensively. Montreal Power is launching a customer campaign, selling common rather than preferred stock.

——CURRENT EASY CREDIT CONDITIONS, moreover, are expected gradually to provide the means and incentive for major senior financing operations to take care of pending merger plans and refinancing operations, many of which have been delayed on account of conditions. Some of this seems imminent.

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New England Association Makes Bond Offering

FIVE PER CENT convertible gold debenture bonds of the New England Gas & Electric Association to the amount of $20,000,000 was offered during the week ended May 15 at 91 and interest, yielding over 5.75 per cent. An aggregate of these bonds, equal to one-half of the amount actually issued, are convertible in the order of surrender for conversion into $5.50 dividend series preferred shares of the association at the rate of ten shares for each $1,000 bond. The association subsidiary companies operate electric and gas properties serving a substantial residential and broadly diversified industrial population estimated to be in excess of 950,000 in more than 150 communities in Massachusetts, New Hampshire, Nova Scotia and other sections in Canada, including the Maritime Provinces.

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Montreal Power Sells Customers Common Stock

CERTAIN UNIQUE FEATURES are attached to the sale of stock to customers by the Montreal Light, Heat & Power Consolidated in a campaign to be announced shortly.

The plan of customer ownership to be followed by this company offers customers common stock with unlimited participation in the profits of the company, as contrasted with the usual American practice of offering customers preferred stock with limited participation. New shares are being offered customers at $50 a share and on the basis of three shares for gas customers and seven shares for electric customers, or ten shares for "dual service" customers. Customers are eligible to subscribe for any number of shares from one to ten and these will be payable in installments.

An additional feature is that customer shareholders who have retained their shares purchased at the time of the previous offer to customers will receive rights on the above basis on their present shares to enable them to buy additional shares at $50 on the quarterly installment plan.

In 1926 almost 20,000 customers responded to the first offer of shares, increasing the list of shareholders from 5,816 at that time to nearly 27,000 at this date.

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Canadian Hydro Gains

CANADIAN HYDRO-ELECTRIC CORPORATION, LTD., reports the production of 199,280,000 kw.-hr. of electric energy in March, a new high record for that month and 19 per cent more than in March, 1929. The output of the plants of the Gatineau Power Company, a subsidiary of the corporation, during the first two months of this year was 12 per cent more than in the corresponding period of last year.

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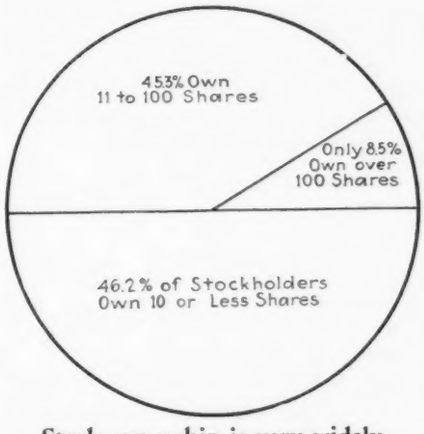
Associated Gas Earnings Pass $100,000,000 Mark



Stock ownership is very widely distributed

TO HAVE increased its gross earnings by 119.1 per cent, its net income by 129.6 per cent and its balance available for dividends and surplus by 315.2 per cent during the year ended December 31 last is the rather remarkable record of the Associated Gas & Electric System. The story is hardly accurate, however, unless it be added that the figures include earnings only since date of acquisition for properties added during the year.

Taking these earnings as of all properties now comprising the system, the growth in gross last year was 10.6 per cent and in net earnings 16.4 per cent. Electric customers increased 6 per cent during the year.

Associated Gas & Electric is one of the most rapidly expanding groups in the industry, if it does not actually take first place. About $34,000,000 was spent for new construction last year in addition to the large number of new properties acquired. This necessitates continuous and extensive financing operations. Last year alone $56,535,000 was raised through the sale of stock to customers or through exchanges of securities previously sold to them. The system sold publicly through its bankers a $40,000,000 issue of 4½ per cent convertible debentures and also an issue of $8 interest-bearing allotment cetificates. Several adjustments were made during the year in the direction of simplifying the capital structure and retiring subsidiary issues.

A feature emphasized in the ownership of the system is the wide distribu-

tion of the stock. Less than 10 per cent of the stockholders own more than 100 shares.

Properties widely diversified

Properties of the Associated Gas & Electric System involve diversification to a high degree. Service is provided to 2,300 communities ranging in size from hamlets to large cities. "Busy Eastern and Middle Western industries, winter resort and fruit-growing sections of the South, mining, agricultural areas and populous New England summer resorts provide diversity of geographical location." The number of customers served by the system increased from 27,436 in 1920 to 1,368,861 last year.

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British Electricity Board Issues Annual Report

THE SECOND ANNUAL REPORT of the Central Electricity Board of Great Britain, covering 1929, has just been issued. Dealing with the schemes in progress, the report states that at the beginning of 1929 the board had under consideration the Mideast England scheme, and during the year it received two further schemes from the Electricity Commissioners, the Northeast England scheme and the Southwest England and South Wales scheme. The report tabulates the position at the end of the year as follows:

Scheme	Area, Square Miles	Population (1921 Census)	Electricity Generated During 1928–29 Millions of Units
Central Scotland	4,980	3,761,222	913.2
Southeast England	8,828	11,392,561	2,645.3
Central England	7,311	5,218,146	1,281.8
Northwest England and North Wales	9,082	6,980,925	1,932.3
Mideast England	7,546	4,666,490	1,116.2
Northeast England*	5,049	2,674,819	831.3
Total adopted	42,796	34,694,163	8,720.1
Southwest England and South Wales†	17,090	6,164,871	644.3
Total	59,886	40,859,034	9,364.4
Great Britain	88,141	42,769,196	9,473.2

*Adopted on January 22, 1930. †Under consideration.

These schemes cover the industrial belt of Scotland and 94 per cent of the area and 98 per cent of the population of England and Wales. During the year the board placed contracts amounting to £8,004,705, making a total on December 31 of £10,899,692.

In Central Scotland four sections of the 132-kv. transmission lines and five transforming stations are in service. By December 31, 244 circuit-miles of lines were under construction and 47.8 circuit-miles were in operation. In Southeast England a 10-mile section of 132-kv. line between Bedford and Little Barford was completed in the spring and put into temporary use at 33 kv. for a supply to the Bedfordshire, Cambridgeshire & Huntingdonshire Company. This was the first of the board's lines in any area to be put into commercial operation. This area is specially noteworthy because of the large amount of underground cable required in London itself. During December the first section of the London cable system was put into service. On December 31, 81 circuit-miles of primary lines, 27 circuit-miles of secondary lines and 105 circuit-miles of underground cable were under construction and 10¼, 1¾ and 16 circuit-miles respectively were in operation. During the year construction work proceeded on fourteen transforming stations.

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Will $5,000,000,000 Eastern Group Become One Utility System?

THE five-billion-dollar group of utility systems stretching from Niagara to the Gulf of Mexico and skirting the Atlantic is probably little nearer actual consolidation today than it was a year ago, but the trend is quite apparent. Tying in of local properties, purchase of subsidiary stock, appointment of directors on boards of allied companies—all indicate the way the wind is blowing.

A relatively recent development in the situation is the increasing importance assumed by the gas properties. A rapid expansion is predicted for the gas industry and its growth will be closely related to the electrical utilities. Columbia Gas & Electric system is now included apparently in the proposed tie-up with Consolidated Gas of New York, United Gas Improvement, Public Service Corporation of New Jersey, Niagara Hudson Power and Commonwealth & Southern. From a stock-ownership standpoint the group also includes United Corporation and American Superpower.

Quarter of nation's electricity

Something of the importance of this Eastern group likely some day to be tied together is seen in the fact that, jointly, they generate more than one-quarter of the power used in the entire United States. The kilowatt-hour output of the group is approximately as follows, out of a total for last year of about 92,500,000,000 kw.-hr.:

	Kw.-Hr. Output
Consolidated Gas of N. Y.	4,678,700,000
Commonwealth & Southern	6,362,400,000
United Gas Improvement (Philadelphia Electric)	3,029,885,000
Niagara Hudson	7,212,743,000
Columbia Gas & Electric	1,203,652,000
Public Service of New Jersey	2,134,581,000
	24,621,961,000

With regard to the next step to be expected in the process it seems probable that each large system will tie in additional local properties. Niagara Hudson Power Corporation has recently taken in Mohawk Hudson Power and is said to be acquiring additional stock of the Central Hudson Gas & Electric Company. It would seem logical that the Consolidated Gas Company of New York should seek control of additional companies in the area, especially on Long Island. The same is true of United Gas Improvement Company and Public Service Corporation of New Jersey.

It would also seem necessary to bring the Pennsylvania Power & Light Company into the New Jersey-eastern Pennsylvania group. Another logical move toward unity is the acquisition of Associated Gas & Electric properties in New York State and in New Jersey by the Eastern combination. When all is said, rumor usually prevails, but undoubtedly definite plans toward co-ordination have been made.

The two outstanding physical aspects of the rumored drawing together of this group are the tying in electrically of Niagara Hudson Power with the Consolidated Gas Company of New York and the provision of an adequate natural gas supply to the metropolitan area including New York City.

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NEWS BRIEFS

Common stock holders of the National Power & Light Company of record May 21 will vote June 11 on a proposal to redeem its $7 dividend preferred stock, of which there are 140,295 shares outstanding.

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Directors of the Central & South West Utilities Company have voted to increase the annual dividend on the common stock from 4 per cent to 6 per cent, payable in common stock. The increased dividend will be effective with the quarterly payment July 15 to holders of record June 30.

General Manufacturing at a Balance

THE rate of general manufacturing in the country as a whole during April remained at substantially the same level as during March, but was 11.9 per cent under April last year, according to reports on electrical energy consumption received by the ELECTRICAL WORLD from some 3,800 manufacturing plants scattered throughout the country.

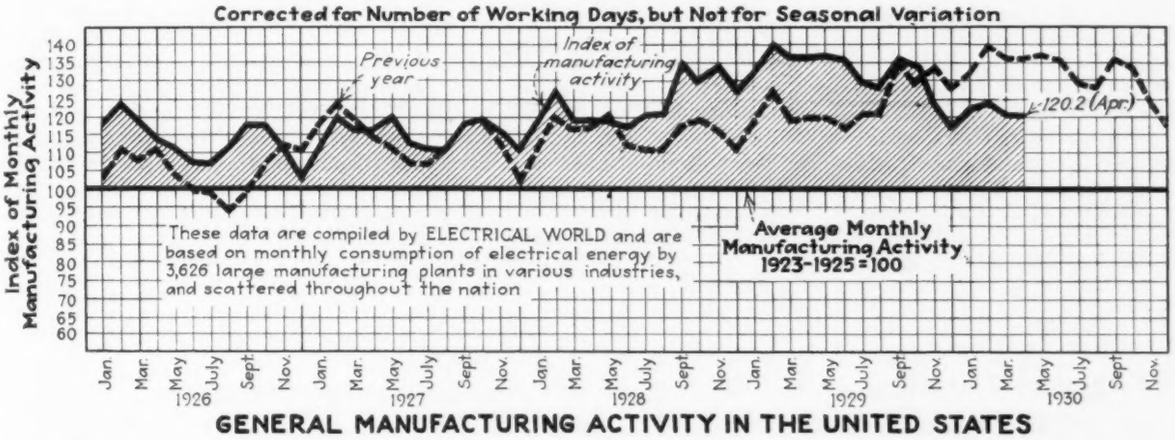
Manufacturing operations for past years indicate that the rate of operations tends to decline during the month of April as compared with March, but this year the customary seasonal decline in manufacturing apparently did not take place, general manufacturing activity remaining at a balance during the March-April period. The average rate of general manufacturing during the first third of the year was 10.9 per cent under the same four-month period in 1929.

Every section of the country except the Western States witnessed a decline in operations during April as compared with March, and every section was operating on a plane materially under April last year. Materially increased Western operations in the food products and lumber products industries during April brought the level of Western general manufacturing operations to a point in the neighborhood of 12.8 per cent above that of the previous month.

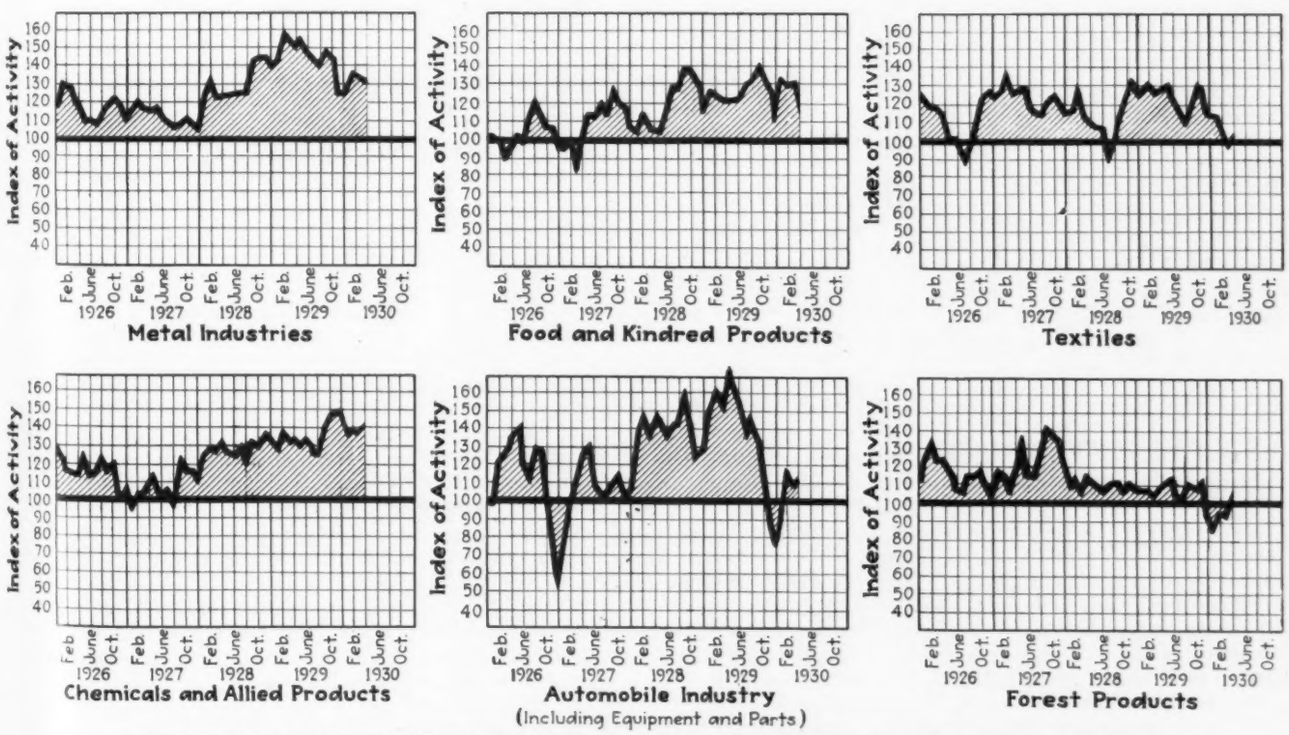
Current Manufacturing Compared with Other Periods

(Nation as a Whole)

Industrial Group	April, 1930, and March, 1930	April, 1930, and April, 1929	First Third 1930 and First Third 1929
All industry	— 0.1	—11.9	—10.9
Chemicals	+ 2.0	+ 6.3	+ 3.8
Food	— 8.0	— 1.5	+ 2.4
Steel plants	+ 1.1	— 9.8	—11.0
Metals	— 4.9	—15.4	—12.6
Leather	+12.9	+11.2	— 5.4
Lumber	+ 9.7	— 4.8	—11.3
Paper	— 6.2	— 6.8	— 0.7
Rubber	+ 6.3	—11.1	— 2.6
Shipbuilding	+10.5	+12.1	+18.7
Stone	+10.2	—10.4	—14.1
Textiles	+ 2.7	—20.1	—19.3
Automobiles	+ 3.7	—33.8	—31.2
New England	— 2.0	—18.0	—14.5
Middle Atlantic	— 4.1	— 8.4	— 4.7
North Central	— 2.1	—14.2	—10.0
South	— 3.6	— 7.1	— 9.3
West	+12.8	— 3.4	—10.1


Corrected for Number of Working Days, but Not for Seasonal Variation
Index of Monthly Manufacturing Activity
Previous year
Index of manufacturing activity
120.2 (Apr.)
These data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,626 large manufacturing plants in various industries, and scattered throughout the nation
Average Monthly Manufacturing Activity 1923-1925 = 100
1926
1927
1928
1929
1930

GENERAL MANUFACTURING ACTIVITY IN THE UNITED STATES



ACTIVITY IN THE PRIMARY MANUFACTURING INDUSTRIES OF THE UNITED STATES

Business News and Markets

8 Per Cent Drop in Equipment Orders

NEW ORDERS BOOKED during the first quarter of 1930 as reported to the Department of Commerce by 81 manufacturers of electrical goods constituting more than 60 per cent of the electrical manufacturing industry were $298,733,208, as against $322,424,619, a drop of approximately 8 per cent from the first quarter of 1929. The total booking for each quarter since the beginning of 1925 includes motors, storage batteries, domestic appliances and industrial equipment, and is presented not as a complete statement of the industry but is probably sufficiently representative to indicate the trend. The totals by quarters since the beginning of last year were: First quarter 1929, $322,424,619; second quarter, $340,863,112; third quarter, $338,169,678; fourth quarter, $288,696,415; first quarter 1930, $298,733,208.

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Allis-Chalmers Reports Record Unfilled Orders

UNFILLED ORDERS OF Allis-Chalmers Manufacturing Company reached a new high mark of $16,770,000 on April 30, an increase of $1,200,000 in a month. This is a gain of 30 per cent over December 31 last. April bookings also set a new high record of about $5,500,000, against $5,334,000 for April, 1929. Bookings for 1929 were the largest on record, being $48,493,817, a gain of more than 34 per cent over the 1928 figure and of 60 per cent over the 1927 figure.

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Cutler-Hammer Purchases Union Electric

ANNOUNCEMENT IS MADE by Cutler-Hammer, Inc., Milwaukee, Wis., that it has purchased the assets of Union Electric Manufacturing Company, also of Milwaukee, manufacturer of motor control, specializing in a very complete line of drum type control apparatus.

The branch sales offices and warehouse stocks of Union will be consolidated immediately with the Cutler-Hammer branch offices and warehouses. The present factory of Union will be operated as a manufacturing division of Cutler-Hammer. E. F. Le Noir, president of Union, will become a member of the headquarters sales staff of Cutler-Hammer. Most of the Union personnel, particularly those in the sales and engineering departments, will also join the Cutler-Hammer organization.

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Anaconda Wire Buys California Company

ANNOUNCEMENT HAS BEEN MADE that the Anaconda Wire & Cable Company, subsidiary of the Anaconda Copper Mining Company, has purchased the California Wire & Cable Company. Application for listing the stock on the New York Stock Exchange revealed the fact that Anaconda Wire & Cable had received authority to list 12,000 additional common shares which are being issued for the assets and property of the California Wire & Cable Company. The California company was incorporated in 1924. Its business consists of the manufacture and sale of weatherproof wires, cables, etc. Plants are located in Orange and Oakland, Cal.

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Bill Aiding Canadian Farmers Passed

A BILL HAS PASSED in the eighteenth Ontario Legislature entitled "An Act to Provide for Granting Aid Toward the Installation of Electrical Works in Rural Power Districts." This bill provides for a fund not exceeding $2,000,000 for the purpose of providing advances toward the installation of electrical services in rural power districts, including wiring from the transmission or distribution lines of the Hydro-Electric Power Commission of Ontario into and throughout dwellings, barns, outhouses and any other works which may from time to time be specified in regulations made under the authority of this act, and also such transformers, motors and other appliances as may be necessary or expedient for any industrial, agricultural or domestic purposes or which may be specified in the regulations.

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Have Rival Equipment Groups Joined Forces Abroad?

THAT the world's largest producers of electrical equipment have reached some sort of accord or truce is the interpretation placed in certain quarters on recent financing and other operations in Europe by American electrical manufacturers. Formerly competing groups appear to have joined forces.

For one thing the German General Electric Company (A.E.G.) has acquired 85 per cent of the capital stock of the Poege Electric Corporation. These shares will be transferred to the Saxon Light & Power Company, or Sachsenwerk, giving General Electric (A.E.G.) a large interest in the combined properties. Furthermore, recent participation by the General Electric Company in the financing of Siemens & Halske (A.G.), a leading German electrical manufacturing concern and a competitor of German General Electric, in which General Electric Company has a 30 per cent interest, is regarded as significant. So also is the fact that Westinghouse Electric & Manufacturing Company is affiliated with Siemens-Schuckertwerke, in which Siemens & Halske has a 51 per cent interest.

Referring to the English situation, recently, Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., made reference to the company's relations with General Electric Company. He said that while the International General Electric Company holds a considerable financial interest in the Associated company, it is nevertheless only a minority interest. Sir Felix said he had been assured that the International company had no desire to hold a majority of shares nor to change the British character of the company. Further, the voting rights of the International company have been placed in Sir Felix's hands by virtue of a power

of attorney. Sir Felix said he welcomed this type of international investment and intimated that this view is widely held in London financial circles.

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TRADE BRIEFS

The Armstrong Electric & Manufacturing Company, heating appliance maker of Huntington, W. Va., has opened a New England sales office at room 420, 10 High Street, Boston, Mass., in charge of Walter H. Morton.

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The Transelectric Company of Indianapolis, Ind., manufacturer of "Power-on" equipment, announces the appointment of H. D. Stier, 101 Marietta Street, Atlanta, Ga., as southeastern representative and the Albert S. Knight Company, 2203 First Avenue South, Seattle, Wash., as northwestern representative.

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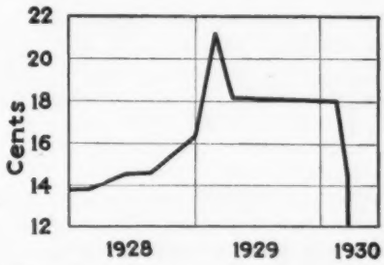
Timken Roller Bearing Company has added J. W. Spray and Henry H. Timken, Jr., to the board of directors.

Record Tonnage of Copper Sold During Week

THE volume of copper sold to domestic consumers in the last week was by far the largest for any seven-day period in the history of the industry.



Trend of copper price over past two years

Excellent buying of copper for export also took place, so that combined domestic and foreign business reached the stupendous total of 190,000 tons. The buying wave, which started on the afternoon of May 7, attained its peak on Monday of the current week, or just before most sellers advanced their quotations to the basis of 13 cents, delivered Connecticut. The unfavorable April statistics had virtually no influence on the situation, as the activity of last week is expected to mark the turning point in the matter of stocks in the hands of producers.

Domestic sales of copper during the week totaled 136,000 tons, the largest weekly total on record.

	May 7, 1930 Cents per Pound	May 14, 1930 Cents per Pound
Copper, electrolytic	12	13
Lead, Am. S. & R. price	5.50	5.60
Antimony	7½	7½
Nickel, ingot	35	35
Zinc, spots	5.00	4.95
Tin, straits	32⅜	33⅛
Aluminum, 99 per cent.	24.30	24.30

EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

Article	February 1929	February 1930
Generators:		
Direct current—		
Under 500 kw.	$114,272	$51,384
599 kw. and over	27,988	78,277
Alternating current—		
Under 2,000 kva.	8,920	9,271
2,000 kva. and over	.....	48,188
Steam turbine generator sets	15,312	249,865
Accessories and parts for generators	72,325	51,695
Arc-welding sets	.....	37,792
Self-contained lighting outfits	132,655	100,083
Batteries:		
Storage batteries—	319,443	.....
6-volt storage batteries	.....	136,737
Other storage batteries	.....	142,366
No. 6 dry-cell batteries	.....	66,758
Flashlight batteries	335,680	334,949
Radio B and C batteries (dry)	91,083	46,580
Other dry and wet cell primary batteries	108,763	28,120
Transforming or converting apparatus:		
Power transformers, 500 kv. amperes and over	137,694	290,932
Distribution transformers, less than 500 kva.	98,223	132,421
Instrument transformers	11,044	24,623
Other transformers	77,075	104,429
Complete battery chargers under 15 amp.	27,233	13,112
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	41,302	168,950
Transmission and distribution apparatus:		
Switchboard panels, except telephone	126,645	202,549
Switches and circuit breakers over 10 amp.	154,530	169,216
Fuses	49,899	38,045
Watt-hour and other measuring meters	125,772	65,778
Electrical indicating instruments	44,208	74,842
Electrical recording instruments	17,423	47,366
Other electrical testing apparatus	69,526	67,691
Lightning arresters, choke coils, reactors, and other protective devices	33,305	50,930
Motors, starters and controllers:		
Motors, ¼ hp. and under	218,441	224,599
Motors over ¼ and under 1 hp.	49,134	59,616
Stationary Motors—		
1 to 200 hp.	$312,281	$478,779
Over 200 hp.	41,305	23,294
Railway motors	40,902	1,625
Electric locomotives—		
Railway	47,685	.....
Mining and industrial	31,772	92,677
Station and warehouse electric motor trucks	28,388	32,304
Starting and controlling equipment—		
For industrial motors	160,683	137,488
For electric railway and vehicle motors	6,501	23,463
Portable electric tools	134,664	129,161
Accessories and parts for motors	276,002	272,850
Refrigeration sets up to ½ ton capacity	498,407	.....
Refrigeration sets over ½ to 1 ton capacity	100,135	.....
Electric household refrigerators	.....	539,817
Electric commercial refrigerators up to 1 ton capacity	.....	163,491
Thermodynamic refrigerators	.....	150
Electric appliances:		
Electric fans	89,615	82,227
Electromechanical health exercisers	.....	8,402
Electric incandescent light bulbs—		
Metal filament	118,258	.....
For automobiles, flashlights and Christmas trees	.....	12,690
Other metal filament bulbs	.....	117,675
Other electric lamp bulbs	49,887	40,800
Flashlight cases	231,143	144,784
Searchlights and floodlights	36,972	35,248
Motor-driven household devices—		
Electric household washing machines	111,283	149,138
Electric vacuum cleaners	135,217	61,746
Other motor-driven devices, except tools	61,765	107,542
Electric flatirons	34,668	18,481
Electric cooking ranges	32,747	14,958
Other domestic heating and cooking devices	91,317	70,786
Industrial electric furnaces and ovens	52,228	68,028
Therapeutic and X-ray apparatus	141,303	166,372
Signal and communication devices:		
Radio apparatus—		
Transmitting tubes, sets, and parts	$76,647	$108,585
Receiving sets	496,706	697,914
Radio receiving tubes	114,434	211,471
Receiving-set components	186,649	224,836
Loudspeakers	130,994	113,096
Other receiving-set accessories, not elsewhere specified	114,879	77,563
Telegraph apparatus	57,311	121,600
Telephone apparatus—		
Telephone instruments	67,984	62,537
Telephone switchboards	47,028	70,193
Other telephone equipment	248,220	356,321
Bells, buzzers, annunciators and alarms	29,640	19,364
Other electric apparatus:		
Spark plugs	259,472	200,438
Other starting, lighting, and ignition equipment	103,023	136,875
Insulating material	110,171	110,285
Metal conduit, outlet and switch boxes	84,516	144,442
Sockets, outlets, fuse blocks, and lighting switches	188,175	154,060
Electric interior lighting fixtures	222,631	181,119
Electric street lighting fixtures	52,003	73,151
Other wiring supplies and line material	109,822	106,857
Other electrical apparatus, not elsewhere specified	904,545	790,377
Rubber and friction tape	43,160	29,098
Globes and shades for lighting fixtures	63,825	58,227
Glass electric insulators	48,283	22,281
Electrical porcelain:		
For less than 6,600 volts	91,099	52,129
For 6,600 volts and over	97,563	84,451
Carbons and electrodes:		
Electrodes for electric furnaces	167,145	210,522
Other carbon products	62,200	45,815
Insulated iron or steel wire and cable	35,676	34,104
Copper, bare wire	305,174	266,888
Insulated copper wire and cable	656,926	.....
Rubber-covered wire	.....	88,536
Weatherproof wire	.....	19,512
Telephone cable	.....	27,319
Other insulated copper wire	.....	264,351
Totals	$10,548,924	$11,275,457
Two months ended Feb. 28	$21,267,041	$23,999,81

Market Conditions

SEVERAL major construction projects have enlivened business on the Pacific Coast. Elsewhere equipment orders are on a somewhat restricted basis. Threatened stiffening of the copper market has proved something of an incentive in the Middle West.

——A SLIGHT INCREASE IN MOTOR SALES due to price adjustments is noted in the Eastern district, but demand is restricted to current needs.

——SOUTHEAST REPORTS SOME substantial wire orders.

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PACIFIC COAST

—GOVERNMENT, RAILROAD, *and other major building is the most encouraging factor of the past week's business. Government inquiries include motor-driven lathes and machine tools for San Diego, seventeen revolving beacons and boundary lights for the first leg of the Portland to Spokane Airway, an intercommunicating telephone system for the naval dump at Hawthorne, Nev., and additions to the Letterman Hospital at San Francisco. The proposal to reduce the Mare Island Navy Yard by several hundred employees is being vigorously fought.*

Railroad business includes a $650,000 addition to the Southern Pacific Hospital in San Francisco, a carload of rigid iron conduit in large sizes, a carload of 1,000,000-circ.mil bare copper wire, a treating contract to cover 200,000 ties for San Pedro, for an electric railway, and $2,000 worth of waterproof rough service cord and cable. Machinery orders include a 300-hp. vertical pump and controls valued at $3,500 for Reno, a 100,000-volt kenotron cable testing set valued at $7,000 for San Francisco, fifteen 72-kva. General Electric induction regulators valued at $35,000 for San Francisco, $5,000 worth of feeder induction regulators for various mid-state substations and one Westinghouse switchboard each for Newark and San Francisco, total value $70,000. Bids are now being received on the $3,000,000 Ford plant to be built in Richmond. Another big industrial plant, said to cost $4,500,000, is to be built at Trona in the California desert for soda, borax and potash. Major construction announced is particularly strong in hotels, including $500,000 Pickwick stage hotels for Eureka and Stockton, a $1,000,000 hotel for Palm Springs, the $2,000,000 Olympic Club structure in San Francisco, a hotel for Los Angeles, and college dormitories for Pasadena.

City Electric & Fixture Company, Seattle, secured the contract, involving in excess of $90,000, for electrical work on city of Centralia's municipal light and power system, work calling for 25½ miles of 60,000-volt transmission line, 71 miles of telephone lines, erection of bus structures and all connecting equipment. The Board of Contracts and Awards, Tacoma, is taking bids until May 26 for construction of superstructure for Cushman power house No. 2 and Puget Sound Power & Light Company is taking bids until May 24 for a $50,000 substation in Bremerton. Specifications will be ready June 1 on various items involved in the construction of a $400,000 auxiliary steam plant in Eugene, Ore., apparatus including boiler equipment, turbo-generator of 6,000 kw. and condenser equipment.

CONSTRUCTION PROJECTS

Coast Counties Gas & Electric Company, Santa Cruz, Calif., plans extensions in power plants, substations and transmission lines to cost about $1,000,000. Southern Sierras Power Company, Riverside, Calif., plans power substation at Barstow, to cost $50,000. Los Angeles, Norwalk, Salinas and Manhattan Beach, Calif., plan ornamental lighting system. Eugene, Ore., plans extensions in municipal light and power plant to cost $400,000. Seattle, Wash., has acquired site for steam-operated municipal power plant of 10,000 kw. capacity. Enumclaw, Wash., plans ornamental lighting system. Southern Colorado Power Company, Pueblo, Colo., will build transmission line at Devine and vicinity.

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NEW ENGLAND

—ELECTRICAL EQUIPMENT SALES *were less active during the past week. Negotiations continue for a few heavy power units; no large orders of interest were reported, though the trend in general is steady, with a slight tendency to decrease in sales volume. Sales of small motors are holding up fairly well.*

One prominent manufacturer placed orders for motors amounting to over $30,000. Sales of fractional-horsepower motors are increasing and according to one manufacturer are above the volume reported last year at a corresponding period. Small generator unit sales are promising; orders recently received include units for a number of installations for both state and municipal purposes.

Central-station equipment sales are spotty. Recently an order amounting to about $8,000 for substation switches and control was placed; orders for insulators are being received in good volume; poles and crossarms are moving well; one manufacturer reports recent orders for 800 treated poles for line extensions. Negotiations for central station equipment have fallen off, though there is yet to be placed through local engineers and planning boards a considerable amount of equipment for station expansion in southwest and western points.

Some specialties are receiving attention; new floodlighting is being planned for a prominent Massachusetts pole-treating plant; additional lights for playground lighting have been recommended for a number of eastern Massachusetts municipalities. Power consumption as reported by one group of central stations shows a slight gain, of about 1.75 per cent over last year for the period to date.

CONSTRUCTION PROJECTS

B. F. Sturtevant Company, Boston, Mass., plans ventilating equipment plant at Berkeley, Calif., to cost more than $500,000.

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SOUTHEAST

—THE INCREASE IN *copper prices brought out a very satisfactory volume of wire orders last week, and while aside from wire purchases there are few individually large orders to report, the total volume is well sustained and one of the larger manufacturers reports an increase in his sales volume.*

A Georgia company placed two orders for bare and weatherproof copper totaling 270,000 lb. and two companies in North Carolina each ordered 40,000 lb. of bare, while another company in the latter state purchased 45,000 lb. of weatherproof copper. Two companies in South Carolina ordered a total of 100,000 lb. of bare and weatherproof copper and an Alabama company ordered the same material to the extent of 90,000. A Georgia company will let this week orders for approximately 750,000 lb. of copper or aluminum wire.

One company ordered this past week $10,500 in disconnect switches and $7,600 in creosoted pine poles. A Georgia company ordered $7,700 in distribution and $4,000 in station service and potential transformers, while a Florida company purchased $5,000 worth of small power transformer equipment. A Georgia company is in the market for

approximately $50,000 in distribution and small power transformers. Wiring supplies amounting to $12,000 were ordered last week on a Georgia textile mill electrification and contract is to be let this week on a weaving mill addition in South Carolina.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Roanoke, Va., plans extension in hydro-electric power plant to cost $1,000,000. Jackson, Tenn., contemplates extensions and improvements in municipal power plant to cost over $50,000. Holston Quarry Company, Knoxville, Tenn., will install rock quarry at Watauga, Tenn., to cost $100,000. Alabama Power Company, Birmingham, Ala., plans installation of ornamental lighting system at Selma, Ala.

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MIDDLE WEST

—THE VOLUME OF BUSINESS *is increasing, although less rapidly than had been hoped for. The major activities, steel, automotive, railroad and electrical industries, are proceeding conservatively, with some improvement noted.*

—AN INDICATED STIFFENING *of the copper market has had a beneficial effect upon business, although hand-to-mouth buying still prevails.*

Some of the interesting orders placed this week include 1,000,000 lb. of triple-braid, weatherproof wire and cable, 350,000 lb. copper busbar, 50,000 lb. wiring solder, "Mazda" lamps valued at $125,000 and several construction orders aggregating $100,000.

Jobbers' sales show some improvement, although still admittedly slow. Railroad business continues to hold up well and some improvement in industrial activity is noticed. Due to the recent warm weather there has been an excellent demand for electric fans.

CONSTRUCTION PROJECTS

Eau Claire, Wis., contemplates ornamental lighting system. Ohio Steel Foundry Company, Lima, Ohio, plans additions in plant at Bay City, Mich., to cost $125,000. State Administrative Board, Lansing, Mich., plans power plant with hospital at Saline, to cost $2,000,000. Deere & Company, Moline, Ill., will carry out expansion programs at local plant, and branch works at Waterloo, Iowa, to cost $450,000. Winnetka, Ill., has plans maturing for extensions and improvements in municipal power plant to cost $350,000. Board of Sanitary Commissioners, Indianapolis, Ind., is asking bids until May 27 for motors, etc. Indiana General Service Company, Marion, Ind., plans power substation, and equipment storage and distributing plant to cost $350,000. Philip Carey Manufacturing Company, Lockland, Ohio, plans insulation manufacturing plant at East St. Louis, Ill., to cost $500,000. Interstate Power Company, Dubuque, Iowa, plans addition in steam-operated electric power plant to cost over $400,000. Des Moines, Iowa, plans ornamental lighting system.

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EASTERN

—WHILE CENTRAL-STATION BUSINESS *has given improvement in the immediate situation in the Eastern market, orders are decidedly restricted. Demand is almost entirely for current requirements and little advance buying obtains. The majority of electrical equipment and specialty manufacturers report trade as very unsatisfactory and disappointing, with the spring season rapidly passing and no change in sight in a sluggish market.*

—REDUCTION IN PRICE OF COPPER has *inspired a little interest in that quarter, which bids fair to be reflected in due course in commitments for finished materials and products.*

A feature of the week is the contract placed by the New York Edison Company with the General Electric Company for two turbo-generator units for the Hudson Avenue station of the Brooklyn Edison Company, each of 160,000 kw. capacity, single-shaft, single-unit design, costing $3,750,000. The machines are scheduled to be in service in 1931 and will form a primary part of the expansion program to be carried out at that plant to represent a total investment reported over $15,000,000, within the next twelve months or so. A central station in Minnesota has ordered a turbo-generator from a New York manufacturer to cost $300,000, as well as a quantity of switchgear amounting to $35,000.

The Anglo-Chilean Consolidated Nitrate Corporation, New York, continues to place heavy business for equipment for a nitrate of soda plant in Chile, orders for ice-making machinery going to the York Manufacturing Company, for gyratory crushers to the Allis-Chalmers Manufacturing Company, and for power shovels to the Bucyrus-Erie Company, all electric-operated. Other equipment purchases will be made for this account. The Chicago Pneumatic Tool Company, New York, has completed a shipment of 30 large air compressor units for the Soviet Russian Government.

A manufacturer of motors says that the recent reduction in the price of such equipment has brought about a slight advance in demand, notably for refrigerating and pumping service; for other industrial purposes, present call is appreciably below normal, and hand-to-mouth buying prevails. A maker of circuit breakers and kindred specialties reports demand as fair with prospects brighter in the early weeks ahead.

CONSTRUCTION PROJECTS

American Can Company, New York, has filed plans for plant addition at Chicago, Ill., to cost over $2,000,000. Consolidated Gas Company, New York, has plans for a repair plant to cost $350,000. Western Electric Company, New York, is having revised plans drawn for six-story unit at Baltimore, Md., plant to cost $2,000,000, for cable and telephone equipment manufacture. St. Joseph Lead Company, New York, plans zinc plant at Monaca, Pa., to cost about $2,000,000. New York Steam Corporation, New York, plans extensions and improvements in generating plants and system to cost $6,500,000, during next twelve months. Buffalo Produce Exchange, Buffalo, N. Y., plans terminal and market, with cold storage plant, to cost over $5,000,000. Atlantic Refining Company, Philadelphia, Pa., plans new unit at oil plant at Point Breeze, to cost $2,000,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until May 27 for 200,000 ft. of high ignition cable for Philadelphia navy yard (Schedule 3408). General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until May 26 for insulators, insulated wire, electrical supplies, etc. (Panama Schedule 2557), and until May 31 for transformers, meter-testing blocks, panel boards, etc. (Panama Schedule No. 2559). Constructing Quartermaster, Fort George G. Meade, Md., will receive bids until May 29 for an underground electric system.

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SOUTHWEST

—THE MOVEMENT OF MEDIUM- *and small-sized motors and transformers has been maintained at nearly the normal volume during the second week of May. None of the large contracts which are being figured have been closed.*

The only sales reported were the motors, transformers and switching equipment for a large grain elevator for $12,000 and four transformers, 333 kva. each, for oil pipe line pumping stations, at $5,000. A lot of distribution transformers worth $3,000 for a power company and ten motors from 5 to 15 hp. valued at $2,000 for an industrial concern.

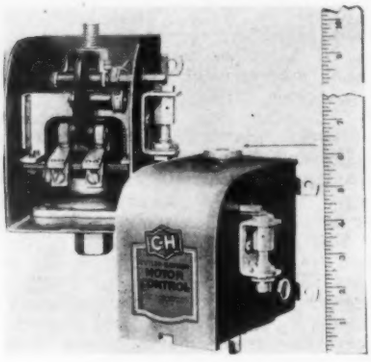
CONSTRUCTION PROJECTS

Wichita, Kan., has approved plans for ornamental lighting systems. Phillips Petroleum Company, Bartlesville, Okla., plans gasoline refining plant at Judkins, Tex., to cost $100,000, and similar plant at Penwell, Tex., to cost $500,000. Arkansas Power & Light Company, Pine Bluff, Ark., plans ornamental lighting system at Earl, Ark. Texas Power & Light Company, Dallas, Tex., plans equipment storage and distributing plant at Trinidad, Tex., to cost over $80,000. Central Power & Light Company, San Antonio, Tex., plans extensions in power plant at Marfa, Tex., reported to cost over $100,000.

New Equipment Available

Single-Pole Pressure Regulator

A NEW SINGLE-POLE PRESSURE REGULATOR, exceptionally small in size, is announced by Cutler-Hammer, Inc., Milwaukee, Wis. This device can be used as a starting switch for motors up to 1 hp., 230 volts, a.c. or d.c., or as a pilot



swich in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens the circuit at high pressure. It can be adjusted to open the circuit at any pressure from 30 to 200 lb. It can be used for maintaining pressure on systems containing water, air, gas and other similar fluids. The inclosing case is black japanned and metal-working parts are cadmium plated. Double-break silver contacts prevent pitting and insure good contact. The diaphragm is of rubber. Conduit knockout holes in the case facilitate wiring.

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Welding Unit Reduces Current Surges

A DEVELOPMENT IN ARC WELDING machines which is now applied to its line of single-operator welders has been announced by the Westinghouse Electric & Manufacturing Company. An entirely new principle has been incorporated in all these welding machines, the manufacturer states, which makes it much easier for the operator to strike and maintain the arc under all operating conditions and eliminates explosive arc characteristics. The welding machines employing this new principle are known as "Flex-Arc" welders.

This improvement in welding machine characteristics is obtained by the use of a special piece of apparatus, known as a "Flexactor," replacing the reactor formerly used and differing in principle of operation from all other types of reactors now in use, the manufacturer claims.

The effect of this "Flexactor" in reducing current surges is equivalent to the effect obtained with six or eight ordinary reactors. Also, its ohmic resistance is not materially greater than that of one reactor as formerly used.

Other features of this machine are drip-proof, rugged and compact construction, mobility, wing nut terminals for welding cable connections, single rheostat adjustment with calibrated dials for accurately adjusting the welding current over the entire range, and high over-all efficiency, the manufacturer states.

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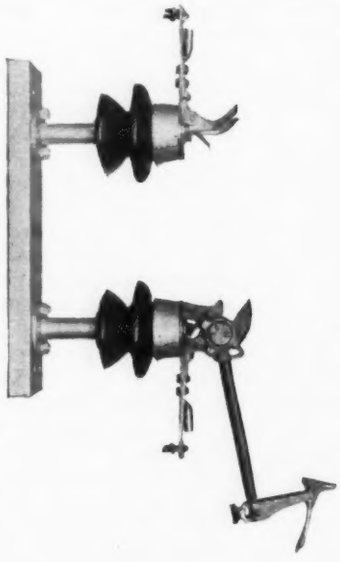
Combined Switch and Indicating Fuse

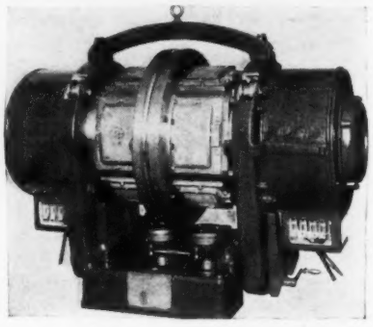
AN IMPROVED DESIGN OF COMBINED switch and indicating fuse for rural lines and also for heavy substation service is announced by the Southern States Equipment Company, Birmingham, Ala. In all types the expulsion tube acts like an automatic disconnecting switch the instant the fuse link has ruptured.



When fuses blow on overloads so small that there is little or no expulsion effect, it is claimed that the switch action will open the circuit. It is also said that troubles from creepage currents are impossible, in view of the nature of the mechanism.

Overcomes Variations in High-Speed Welding

A NEW TYPE OF ELECTRIC WELDING unit brought out by the American Electric Fusion Corporation, Chicago, overcomes the defect of a.c. welding at high lineal speeds, it is claimed. This unit, instead of utilizing alternating current directly for welding, utilizes the same current for driving its two 35-hp. motors directly connected to an acyclic generator generating approximately 2½ volts



and capable of delivering currents up to 20,000 amp.

The arrangement of the generator is such that the delivery of welding current is made directly to circular busbars that surround the stator of the generator, the welding rings being directly attached to these circular busbars. Thus, while the rotor of the generator rotates at a high rate of speed within the generator frame, the frame itself rotates slowly over the seam of the tube as it passes beneath the generator. In preliminary trials speeds as high as 200 ft. per minute were readily obtained with this unit and there is no reason why, with increased excitation and increased horsepower, speed could not easily be obtained which would be double those reached on preliminary trials, the manufacturer states.

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A SAFE, HANDY, STRONG FUSE PULLER made of high dielectric horn fiber is announced by the W. N. Matthews Corporation, St. Louis, Mo. It is easy to manipulate and designed to grip firmly with little pressure, being adapted also to use in the hard-to-get-at places. This tool was designed primarily for use in removing cartridges from Matthews "Fuswitches," but it has quickly come into demand for pulling and replacing cartridge type fuses from panelboards, opening or closing fuse switches which have cartridges mounted on the door and many other uses where the operator needs a safe insulated tool, according to the manufacturer.